The
Electrical Review

VOL. CXIV. MARCH 16, 1934. No. 2938.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY. Price 6d

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, WATLOO, LONDON." Code, A B C. Telephone No.: Hop 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

Principal Contents:

	PAGE
The Use of the Electron	367
Electrical Progress in Pretoria. By L. L. Horrell	370
Rural Electrification Problems. By R. M. Charley	371
German Domestic Appliances. By Viola Ripley	373
Projector Arc Control	374
The Ormskirk Training College	375
A Paris Exhibition. By S. Henry Kahn	376
Meetings and Discussions	377
Correspondence: Suggestions for a Two-part Tariff; A Middlesex Appointment; What E.D.A. Might Do; Self-contained Saucepans; Engineers and Economics; Electro-thermal Apparatus; A Lift-control Problem	381
New Apparatus and Devices	383
Trolley-bus Control Gear	385
Dutch Electrical Imports and Exports	385
Parliamentary News	386
In the Courts	386
Business and Industrial Notes	388
Electricity Supply	391
Traction	393
Communications	393
Contract Information	394
Our Personal Column	396
New Companies Registered	397
Returns of Electrical Companies	397
City Notes	397
Stocks and Shares	399
Published Specifications	401
New Work for Contractors	402

The Use of the Electron

IT is only during the past twenty years or so that the free electron has been regarded as having a practical bearing on the day-to-day uses of electricity and a very much less time since it was so applied. Previously only electrons that were safely confined within conductors appeared to possess material significance.

The paradox is that while we are far less confident that we know what the electron ("Nature's unit of electricity") really is—a wave while arriving and a particle on arrival appears to be as near as we can get to placing it just now—we are rapidly extending our knowledge of its characteristics and of what to do with them, which is the essential thing.

We are not among those who expect the production of electricity to be revolutionised through developments of this kind, but we do believe that the investigations of physicists will influence considerably the ways in which electricity will be used, and thus encourage still greater use.

The valuable characteristic of free electrons is that the speed of their liberation can be determined within almost inconceivably fine limits. On this depends, for example, the functioning of the radio valve and of light-sensitive apparatus with its potentialities for the close automatic control of many industrial processes. Another development is the discharge lamp, in which the insulating properties of gas are broken down by the radiations from outer space known as cosmic rays.

Once liberated, electrons can be increased at almost any speed; although they do not obey Ohm's Law, they are subject to an equivalent law, in that the ratio of emission of energy is proportional to frequency.

As in most cases liberation is effected from an incandescent conductor, the subject of last night's Faraday Lecture, "The Electrical Engineer and the Free Electron," delivered by Mr. C. C. Paterson, presents a peculiarly apt contrast to that of the Kelvin Lecture next month, when Professor J. C. M'Lennan will deal with "Electrical Phenomena at Extremely Low Temperatures."

The Faraday Lecture is intended as a popular exposition, and while Mr. Paterson's lucidity easily fulfilled this requirement, there can have been few, if any, who could fail to gain from his synthesis of available material. In its combination of clear explanation and practical demonstration of fundamental principles it was the kind of lecture that Faraday himself would have chosen to give.

Apart from the immediately practical problems of devising the most efficient means for liberating the electron for use, there is a wider aspect of the subject in the additional emphasis it lays upon the value of research work and on the need for a broad scientific basis for technical education. Thus, it is to electrolysis that we owe the beginnings of the line of thought that led up to the isolation of the electron, and it is to physics generally that we must look in future for innovations in the electrical sphere.

Changes in the Commission

BY the retirement next July of Mr. W. W. Lackie the Electricity Commission will lose the services of an engineer of mature experience, who, in the quiet way natural to him, contributed greatly to the successful working of that body. With the exception of Sir John Snell, whose health is so far improved that he will be able to continue as chairman, Mr. Lackie is the last of the original panel of five Commissioners appointed fourteen years ago "for promoting, regulating and supervising the supply of electricity." The appointment of Mr. J. M. Kennedy as his successor is appropriate on two grounds: first, he played a considerable part in the preparation of the grid schemes and in the working out of their technical bases; secondly, at the other end of the scale, he has for many years been keenly interested in problems concerning the use of electricity. The paper which Mr. Kennedy read, as joint author, before the Institution of Electrical Engineers in February of last year, the value of which was enhanced by the lively discussions it provoked all over the country, showed

how keenly he had investigated the various aspects of distribution—a weightier matter than was the consideration of generating plant.

Noise Measurement

THE paper and discussion at the Institution of Electrical Engineers on "The Measurement of Noise" seemed to us to make a definite contribution towards reconciling scientific measurement (using the logarithmic scale of decibels) with the average listener's impression of loudness. Although the utility of the scale of loudness proposed is less in that part of its range in which it may be used to decide what noise is tolerable, it gives a clearer conception of the subjective effect of decibel variation in the higher ranges. Instead of having a pure reference note, we would prefer to be able to select frequencies similar to the noise to be measured, whether it be the comparatively definite range emitted by the static transformer or the complex sounds of rotating machinery. The use of audiometers is easy, even to the uninitiated, but standardisation in the methods of using available instruments appears desirable, with an appreciation of the exact circumstances in which a complaint of noise has been made, since noise measurement is required essentially because noise is undesirable. The new scale should be helpful in dealing with complaints from the public, but the decibel scale will still retain favour for scientific and engineering purposes.

Telephone Service

THE Telephone Development Association has in the past been severely critical of the aloof attitude adopted by the Post Office in its dealings with the public; its recognition of the change of heart that has taken place recently in the Department is all the more notable. In expressing this view, Sir William Noble (chairman, T.D.A.), who had many years of inside experience of the Post Office, acts as spokesman for electrical men generally, who realise the importance of the telephone in spreading the electrical idea. The success of the publicity campaign, the feat of Sir Stephen Tallents in creating an atmosphere of friendliness that was formerly notoriously absent, and the note of keenness to give prompt and reliable service that runs through the reports of the district engineers, are matters for considerable satisfaction. The appointment of Col. Donald Banks as Director-General gives a member of the permanent staff a status that is necessary for the development of a large trading concern, which will be probably all the more desirable in view of the elevation of the Postmaster-General, Sir Kingsley Wood, to Cabinet rank.

The County Co.'s Report

THE County of London Electric Supply Co. continues to grow extensively and intensively. During 1933 new areas were brought into its sphere of activities, and the demand from the older areas advanced in a very satisfactory manner. The net result was an increase in the output of nearly 89 million kWh—the total being 693 million, about 5 per cent. of the output for the year of all the British authorised undertakings. Barking, the largest station in these isles, and the Wandsworth station are now operating as "selected stations," and will be responsible for a very large proportion of the energy supplied from the South-East England section of the grid. The magnitude of the work carried out annually by the company can be gauged from the statement in the report that during 1933 the company's transmission and distribution network was extended by 276 miles, while eighty new transforming stations were put into service.

North-Eastern Progress

THROUGH the past lean years the North-Eastern (*née* Newcastle) Electric Supply Co. has pursued an upward course, industrial losses being counterbalanced by domestic gains, and the report for 1933 just issued records a further advance. The connections to the company's system rose by 44,252 h.p. to 867,477 h.p., and the profit rose at the same time. The capital expenditure was £467,721, mainly upon the distribution system, representing a very extensive development. The standardisation of frequency which has held up the operation of the grid in this area is progressing satisfactorily. During the year the company successfully converted its large consolidated first mortgage debenture issue from a 4½ per cent. to a 3½ per cent. stock, which will effect a substantial annual saving.

S. W. & S.

THE Shropshire, Worcestershire and Staffordshire Electric Power Co. (necessarily known colloquially as the "S. W. & S.") is expanding rapidly, as witness the proposal to raise the capital and borrowing powers by £2,000,000. The 1933 report gives a long list of new areas in which electricity was made available; the number of consumers served by the company and its subsidiaries (excluding the South Wales Electric Power Co.) rose by 19 per cent. The year's expenditure on capital account was £316,575—another indication of the magnitude of the company's operations.

Acceleration

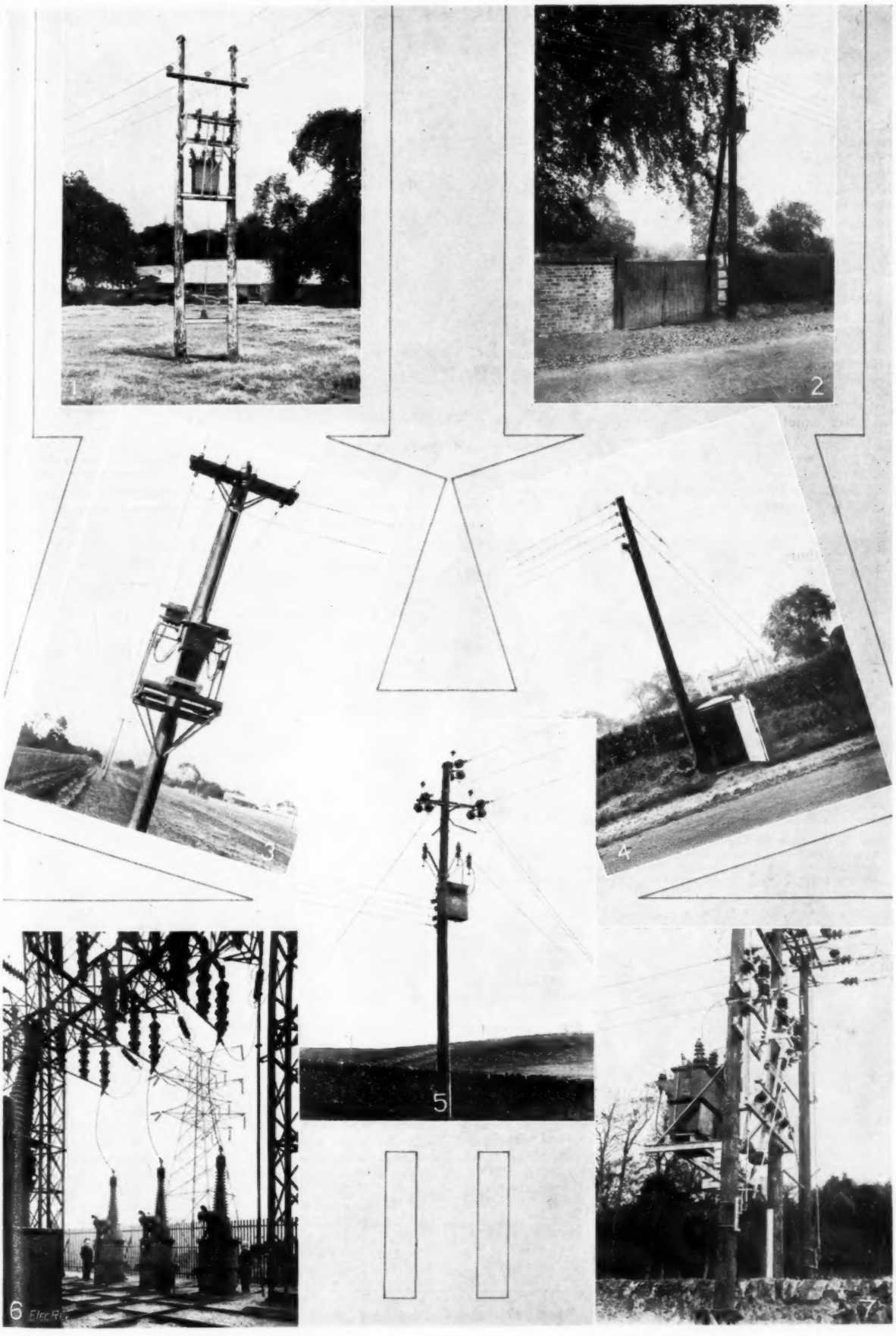
SUPPORT is given in the last monthly generation returns for the optimistic note struck by the Minister of Transport, the Hon. Oliver Stanley, in his recent reference to the prospects of the electrical industry. The increase of 16.5 per cent. in the output of public supply stations in February brings the total so far this year to 15.6 per cent. in excess of that for the corresponding period of last year, this rate of increase being half as much again as the satisfactory figure of 10 per cent. for the whole of 1933. There appears to have been no single outstanding feature to account for the improvement in the rate of growth over previous winters. The improvement is progressive as well as cumulative, since the first two months of last year were 8.4 per cent. better than those in 1932, which were 6.5 per cent. in advance of 1931, which again exceeded the January and February figures for 1930 by 4 per cent.

The Regulation of Public Lighting

THE motoring correspondent of a weekly journal draws attention to the apparently greater safety of American roads as compared with our own as revealed by statistics, but he makes no suggestion as to how far this may be due to a difference in public lighting arrangements. An outstanding reason for the inadequate illumination of many of our roads is the inability of rural authorities to find the funds, or their disinclination to spend money on developments that bring no benefits to the locality. Next to the provision of proper intensity comes the need for uniformity of illumination in streets of the same grade in adjoining local areas. Who is to decide whether a road falls within Classes A, B, or C of the British Standard Specification? Surely it should be within the province of the Minister of Transport to devise a scheme for the regional control of public lighting, with which should be associated traffic control signals and island light-houses. Mr. C. W. Sully says that this question is engaging the attention of the Illuminating Engineering Society. We hope that this will lead to prompt action, as, until the illumination question is settled, talk about road safety seems futile.

"Special Circumstances"

ADDRESSING the shareholders of the Sheffield Gas Company this week, Lt.-Col. H. K. Stephenson, the chairman, was kind enough to say that "electricity has, of course, many uses, but in the matter of heating and public lighting, except under special circumstances, it cannot compete with gas." To what, then, does Lt.-Col. Stephenson attribute the rapid advance of electricity? Is it merely perversity on the part of the people who like to waste their money in this way, or can it be that "special circumstances" are increasing? Gas company shareholders are very docile, and may swallow this kind of statement, but a wider public appears to know better.



Examples of Rural Distribution Equipment (See page 371)

1. An 11-kV falling-frame type switchfuse. 2. An interconnected star balancer. 3. A pole-mounted automatic regulator in Australia on a 400-V three-phase feeder. 4. An automatic induction regulator. 5. A fuse-protected 25-kVA three-phase transformer on an angle pole. 6. A 132-kV sub-station for rural distribution. 7. A 33-kV falling-pole type switch in Scotland

Electrical Progress in Pretoria. By L. L. Horrell

Supply to be given to a large steelworks

THE Pretoria electricity undertaking is one of the oldest in South Africa. It commenced operation on June 15th, 1892, as a private company under concession from the Republican Government of the Transvaal. The plant consisted of five Crompton 40-kW dynamos driven by Colchester compound engines. The undertaking was acquired by the Municipality in December, 1904.

The old station was reconstructed in 1907 and Belliss & Morcom engines coupled to A.E.G. dynamos were installed, the total capacity being 2,000 kW, later increased to 3,000 kW. Realising that the old station, which was in the centre of the town, was too small, the Town Council decided in 1919 to erect a new station on the Western Town Lands at a place where a dam for water could be constructed and a railway siding for coal was available. Messrs. Clark & Partner were appointed consulting engineers, and they designed a station with three 3,000-kW sets generating three-phase current at a pressure of 6,600 V.

The Pretoria municipal power station

Mr. L. L. Horrell, the writer of this article, is City Electrical Engineer of Pretoria, and is at present in this country in connection with the extension of his station. He is accompanied on his visit by Mr. M. G. Nicolson (right), the Town Clerk of Pretoria

This station started up in October, 1923, and in March, 1924, the old station was closed down after running for thirty-two years. The load increased so rapidly that two additional sets have since been installed, *viz.*: a 7,500-kW set in 1928 and a 12,500-kW set in 1932.

At this stage, the Council still further stimulated the advance of the use of electricity by extending the mains in all directions and by reducing tariffs. In or about 1924 the Union Government appointed a commission of experts to investigate the prospects of starting up an iron and steel works in South Africa, and, after due investigation, it was decided to carry out such a scheme and to build the works in Pretoria; these works are now practically completed and within a few months will be in full operation. Although the Steel Corporation is producing power in its own station from waste heat, the amount available will by no means be enough for its requirements and it has asked the City Council of Pretoria to provide a supply of electricity which, it is expected, will be in the neighbourhood of 9,000 kW.

The City Council, therefore, decided to enlarge the station without delay and, with that object in view, sent their Town Clerk and City Electrical Engineer to England to confer with Messrs. Merz & McLellan, the Council's consulting electrical engineers, and to prepare specifications and call for tenders for additional plant.

After due consideration it was decided to call for tenders for one 12,500-kW (economical rating) turbo-alternator and for two 80,000 to 100,000 lb. per hour boilers together with steelwork buildings, switchgear, transformers, &c., and one 50-ton electric crane. The tenders have been received and are now being considered by the engineers.

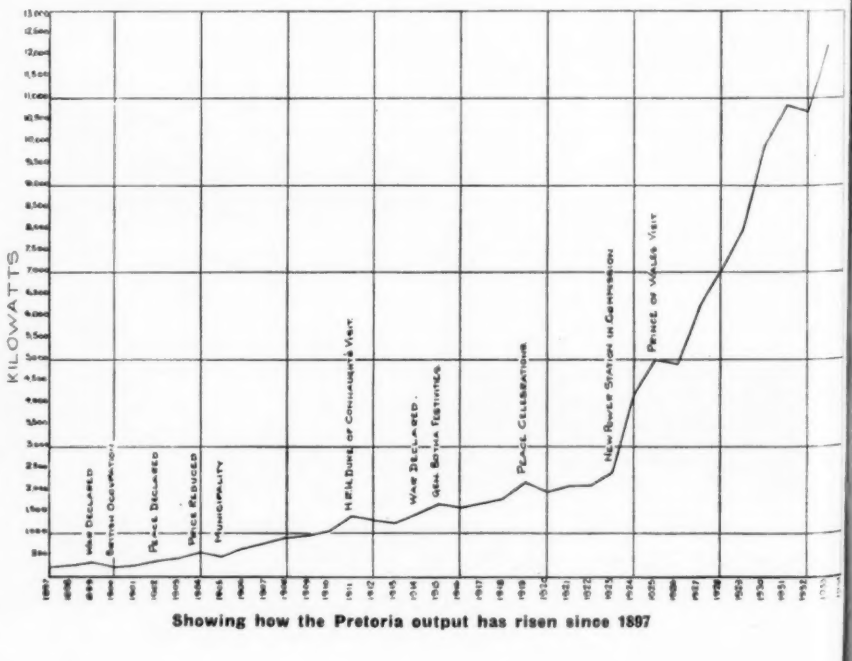
A Chequered Career

It will be seen from the accompanying chart that the undertaking has passed through exciting times, and it was not until the Municipality took it over and encouraged the use of electricity for domestic purposes that development to any extent took place.

The Pretoria Council offers facilities to householders to use electricity for domestic purposes by supplying current on a two-part tariff, the secondary charge being ½d. per kWh, and also by financing the purchase of appliances. Current is supplied on the off-peak loads at ¼d. per unit for water heating. That the Council has benefited by this forward policy can be seen; in the year ended June, 1928, 18,000,000 kWh was generated, while in 1933, five years afterwards, over 44,000,000 kWh was produced.

Further enormous expansion is bound to take place in the near future as a result of the establishment of the new iron and steel works upon which capital amounting to £6,000,000 has been expended, and of the subsidiary industries which will follow.

The Council has laid out an industrial township, lots in which are being sold freehold at low prices covering cost of services only. It is fully anticipated that the growth of the load will be such as to necessitate the installation of additional plant in three years' time.



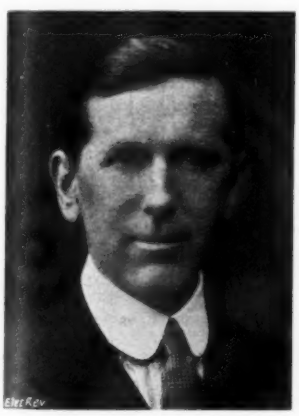
Showing how the Pretoria output has risen since 1897

RURAL ELECTRIFICATION PROBLEMS

By R.M.CHARLEY, B.Sc., A.M.I.E.E.

THE supply industry has touched only the fringe of the load obtainable from rural and suburban districts, and as I have had opportunities, although a manufacturer, of learning of the problems met with by operating engineers I will here try to suggest solutions of some of them. In this article I am assuming that an overhead 11-kV, three-phase, four-wire system is employed.

I consider that the most suitable type of switchgear equipment is that which incorporates a cartridge fuse, which, I maintain, has great advantages over any other. These can now be made for rupturing capacities as high as 100,000 kVA at 11 kV, and the time setting can be graded so as to obtain some degree of discrimination. They can be made to operate under short-circuit conditions in 0.001 sec. or as long as 0.027 sec. The enclosed cartridge-type fuse does not deteriorate as do most other types. An alternative type of cartridge fuse fitting is available for fixing permanently on the pole, the fuse being inserted or withdrawn by a long pole. This arrangement is appreciably cheaper than the falling-frame switch and has found a big demand for rural work.



Mr. R. M. Charley is a member of the staff of the English Electric Co., Ltd.

Troubleless Transformers Essential

The practice of connecting transformers solid to a line should be extended. This has been done in many parts of this country with complete satisfaction, as modern transformers are, perhaps, more reliable than any other electrical apparatus. There must be protective switch- or fuse-gear at the tee, but if, say, half a dozen transformers are connected to the spur, they can be coupled up without any fusegear. I believe this practice might even be developed to include small 33-kV transformers.

It is unsound to purchase the cheapest transformer obtainable. The desire of operating engineers should be to put the transformer up the pole and forget it; for this they must have the utmost confidence that the transformer is thoroughly reliable and that the oil will not deteriorate. All such transformers should be completely filled with oil and provided with an expansion vessel. As this construction is oil-tight it must be weatherproof. It was impossible to see if the older type of transformer really was weatherproof, and the operator could not be aware of a leakage until the transformer had broken down due to the ingress of moisture.

I strongly recommend that all these transformers should be equipped with tapping switches. Almost all transformers are provided with tappings, but full advantage is not taken of them, especially when the transformer cover has to be removed in order to get at the tapping board. If this process is carried out up a pole, the chances of ill-effects, due to the weather or a man dropping a spanner or nuts into the transformer, are very great. The provision of the tapping switch not only guards against such risks but also saves a considerable amount of time, and the small additional expenditure is well worth while.

It has been argued that the use of bushings in a transformer cover is undesirable because the cover cannot easily be taken off in order to remove the core and windings, but such practice is to be condemned as a transformer should be considered as a single self-contained unit; if anything is wrong with it, it should be replaced by a good transformer. Even if the cover could be removed, the value of a visual inspection is doubtful, and even so it is practically certain that the transformer would have to be taken down and removed to some point where the core and windings could be lifted.

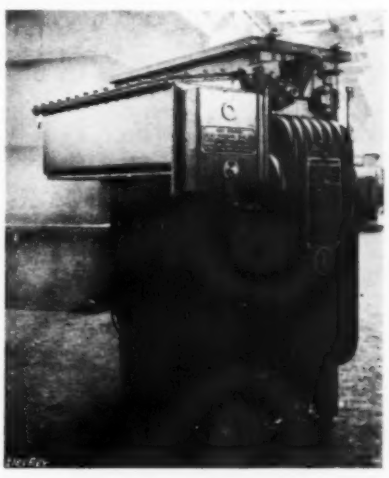
Iron and Copper Losses

The emphasis placed by many engineers on the importance of low iron loss without reference to copper loss seems to me unjustifiable. For equal cost a low iron loss means a relatively high copper loss, which is often disregarded on the ground that the load factor is low and the copper loss is proportional to the square of the load.

With domestic loads, where the power factor is practically unity and the transformers are small, the regulation is practically the same as the percentage copper loss, hence the transformer having low iron loss and correspondingly high copper loss has a poor regulation, which means a correspondingly greater drop of voltage at the consumer's terminals. This point is of tremendous importance, as the cost to the supply authority of the iron loss is only about the cost of generation, a small fraction of a penny, whereas for every kWh that is lost due to fall of voltage at the consumer's terminals the authority loses the tariff value which may be 6d. per kWh.

I believe, therefore, that much too great an importance has been attached to low iron loss, but I am confident that copper loss, especially in its effect on regulation, is of tremendous significance. A number of authorities have endeavoured to capitalise the value of losses; the Overhead Lines Association has produced a formula for this purpose, but this does not take into account the benefit of the regulation factor.

The use of interconnected-star balancers in connection with three-phase, four-wire distribution is becoming much more common. If they have not fulfilled expectations in all cases, I suggest that the balancer has not been installed in the best position or its impedance has been too high. The function of this apparatus is to relieve the neutral of the out-of-balance current, in which case it must be placed as close as possible to the source of this out-of-balance; where the load is distributed along the line, several balancers should be installed.

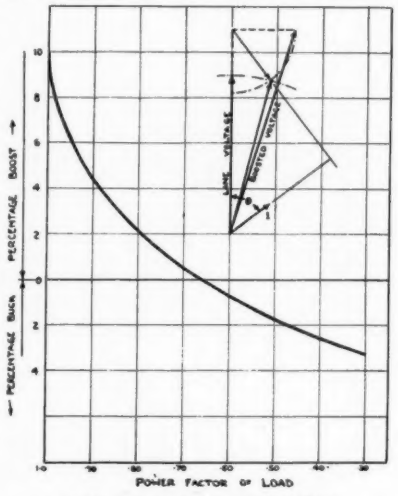


A typical small transformer with on-load tap-changing gear

Experience has shown that the disturbing influences can usually be identified and for effective operation the out-of-balance current must flow through the balance windings instead of going back through the fourth wire. I therefore strongly urge in such cases the use of a choke coil on the sub-station side of the balancer. The effect of this is to force the out-of-balance current to flow through the balancer. The application of this

scheme has given relief where the voltage has previously been very irregular.

Recently engineers on the staff of a large municipal supply authority presented a paper to the Institution of Electrical Engineers in which they acknowledged that it was not practicable to pass on to the consumer the voltage variations that were legally allowable, and that the installation of voltage-regulating equipment had increased the undertaking's revenue.



Load power factor and voltage

At the present time, all grid and most bulk-supply transformers are provided with on-load tap-changing equipment, but this will not give satisfactory conditions on each individual part of the distribution system and further regulating equipment must be provided for the distributors. Personally, I believe that within a few years all distribution transformers, down to perhaps 50 kVA, will be provided with on-load tap-changing gear, probably automatically controlled. The hundreds of thousands of transformers already installed cause serious voltage-regulation problems and separate voltage regulators will have to be installed. For such purposes, I recommend the induction regulator, which for automatic control is much superior to a tap-changing transformer.

The three-phase induction regulator functions through phase displacement; there is no relation between this phase displacement and power factor, and the time-space positions of the phases of both current and voltage are changed simultaneously. It is incorrect to say that the reactive type of regulator has no phase displacement, since its reactance is of a comparatively high value, and the amount of phase displacement, which depends on load and power factor, may be even higher than with the corresponding induction regulator.

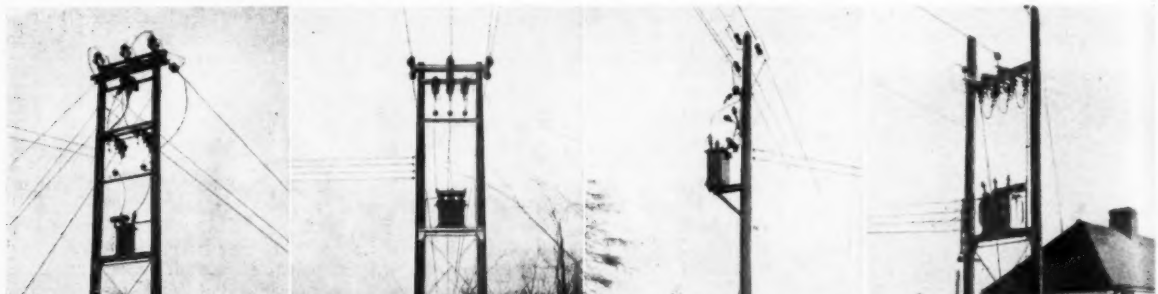
There is, however, a more serious drawback to the reactive type of regulator, which is essentially a transformer having a certain turns ratio. The resultant voltage with full boost and for unity power factor is given by the vector at the top right-hand corner of the diagram reproduced, an essential feature of which is that the reactive component must always be at right angles to the load current. This component will move along the arc of a circle struck from the top point of the diagram. Another vector represents a load current at a power factor at which there is no boost; the diagram further shows that if the power factor falls there will actually be a reduction in voltage.

The curve that has been plotted from this vector shows that 10 per cent. boost is reduced to about 2.2 per cent. at 80 per cent. power factor and disappears altogether at 65 per cent. power factor. Compensation for this effect can be obtained only by making the regulation so much bigger that it would be uneconomical in both price and increased losses. Moreover, the reactive type of regulator has inherently greater losses than the induction regulator. Experience has shown that in many cases the induction regulator, which admittedly is more expensive than the reactive type of regulator, has been the most economical type to install.

On-load Tap Changing

The addition of on-load tap-changing gear to a transformer often nearly doubles the price; if the equipment is to be automatically controlled the increase is much greater still. For this reason engineers sometimes rule out without further consideration the adoption of additional voltage-regulating gear. But there should be no connection whatsoever between the cost of the regulating equipment and the cost of the transformer. Any comparison should be taken as a percentage of the total cost of the distributor, of which it will be a very small fraction.

The standard secondary transmission voltage in this country is 33 kV. If distribution is to be at 11 kV, there must be main step-down transformers and switchgear, whereas with 33-kV distribution these would be eliminated. It may be argued that the cost of small distribution transformers and switchgear is much greater at 33 kV than at 11 kV, but I suggest that if the supply authority looks well ahead as regards the increase in load and puts in comparatively big transformers the difference in cost is comparatively small. Furthermore, as the intermediate step-down transformers and switchgear would be eliminated, 33-kV distribution would probably be found to be ultimately the more economical. This scheme is being used in a number of cases with entire satisfaction, and I believe that 33-kV distribution will be as common as 11-kV distribution within a few years. It is also reasonable to expect that in time rural supplies will be given direct from the 132-kV grid.



Examples of Pole Transformers

1. 10-kVA, single-phase, 11,000/237-V, 7/12 copper-cored steel line. 2. 25-kVA 11,000/410-V copper line. 3. At Long Newton, Malmesbury area. 4. 50-kVA, three phase, 6,300/410-237-V transformer at Wooburn Green

North Midlands I.E.E. Dinner

THE annual dinner of the North Midland Centre of the Institution of Electrical Engineers took place on March 9th at the Hotel Metropole, Leeds, when the chairman (Mr. J. N. Waite, city electrical engineer, Hull) presided over a gathering of about 100. In proposing the toast of "The President and the Institution," he suggested that greater attention should be given in papers read before the Institution to subjects directly related to the supply section of the industry. The President (Mr. P. V. Hunter, C.B.E.), responding, paid a special tribute to the high standard of discussions at the provincial centres which, he honestly believed, were on the average more pertinent and critical than those in London.

The health of the guests was proposed by Mr. R. M. Longman, past-chairman of the Centre.

Sir William Ray, executive chairman of E.D.A., in response, said he was glad the chairman had made reference to the importance of the economic side, for he was particularly anxious to know what part taxation and the rating of the undertakings and premises played in determining the costs of production. So far as British trade and industry were concerned, one of the greatest necessities was the study of costing, and nothing was more vital to the progress of public service undertakings than a study of public expenditure as it affected electricity undertakings and society in general.

German Domestic Appliances. By Viola Ripley, B.Sc.

EASE of cleaning is the outstanding feature of the domestic electrical exhibits at the Leipzig Fair this year. This is particularly the case with the electrical appliances in porcelain shown by the Porzellanfabrik Ph. Rosenthal & Co.

Left: The interior arrangements of the "Santo Junior" refrigerator produced by the A.E.G. Right: A "Carnefix" cooker—another product of the same concern

This firm has a reputation for fine porcelain ware, and by producing new ceramic bodies capable of withstanding the temperature changes experienced in electric cooking, it has been able to produce devices of very fine appearance and high efficiency. The table grill consists of an outer frame provided with ventilating holes in which rests a removable heating element also of ceramic material. The grill can be used for turning over a dinner plate to cook from the top. A similar grill is made by Siemens.

The special boiling device made by the Porzellanfabrik concern is particularly designed to ensure that foods and drinks come into contact with porcelain only. This consists of a porcelain container with a heating element at the bottom in which various special porcelain jugs and pots can be placed. As these vessels are heated not only at the bottom but also on the sides by radiation cracking of the vessels is eliminated. Vessels can actually withstand when dry a temperature of 500 deg. C. The outer portion of the appliance is provided with a polished metal reflector so that an efficiency equal to that obtained with flat boiling plates with special utensils is achieved.

A section of the new Siemens boiling-plate element

Two kinds of coffee machines in which the coffee comes into contact with porcelain only are also shown. One of these works on the fountain system and the other on the two-chamber system.

The *E.T.Z.* has impressed on people the need for making the bottoms of cooking utensils fit properly on the surface of the hot-plate, have a proper diameter in proportion to that of the hot-plate and be easy to clean. In response to this the Wagner G.m.b.H., of Esslingen a.N., is showing special apparatus at Leipzig. Particularly useful is the pouring-out rim of the utensils of this firm which facilitates pouring out, reduces the soiling of the sides of vessels and hot-plates, and prevents incomplete contact between the vessel and hot-plate. These vessels are made in aluminium, stainless steel and copper.

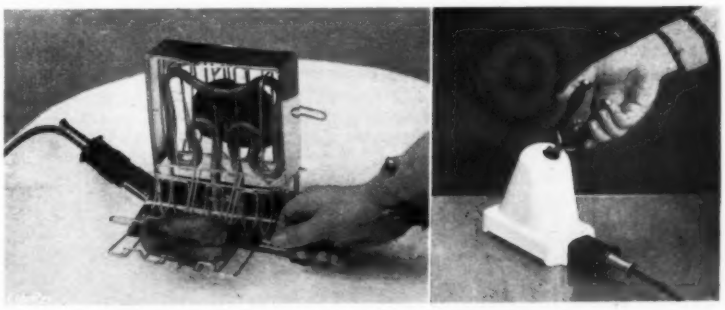
The A.E.G. is showing a pedestal cooker with two, three or four smooth-faced plug-in elements having the top hinged so that the space between the hot-plates is readily accessible for cleaning. The design of the body is entirely smooth and free from corners and screw-holes, following the lines which have proved successful and attractive in the design of refrigerator bodies. The front and back of the top plate is slightly raised, so that in the event of an overflow, the liquid does not run down the back or down the front over the switches, but only down the sides, which are easily cleaned. The inner body is of smooth welded-steel construction with well-rounded corners and is porcelain enamelled, whilst the heating elements are insulated by beads and pass through channels welded on to the outside surface of the interior. Heat insulation is assisted by an aluminium-sprayed steel case.

Siemens are showing a new kind of hot-plate designed on scientific lines to ensure rapid transfer of heat from the element to the surface. The design has enabled higher loadings to be obtained in a given space without increasing the working temperature of the element. An electric cooker combined with a small coal stove, also shown by Siemens, is claimed to be particularly useful for kitchens without heating arrangements.

Another Siemens exhibit is a circular table-type boiling plate for hotel use, having six circular elements round the circumference and a large hot-plate in the centre. The advantage claimed is that all six outer rings can be used at once with the greatest convenience whilst the centre-plate can be used for dishes which require to be kept hot.

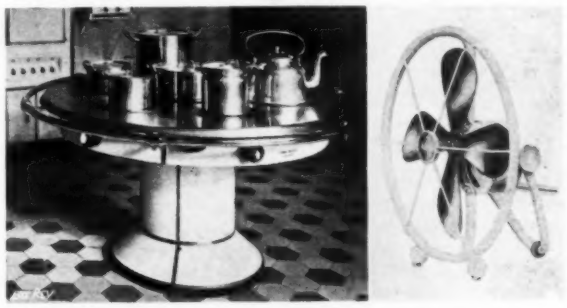
Voigt & Haeffner are showing the "Prometheus" toaster which has a tubular element in place of the usual wound mica construction. The whole of the body is readily detachable for cleaning. The same firm shows a curling-tong heater in porcelain of very attractive ivory finish.

Two neat 25-W a.c. fans with induction motors are shown by the A.E.G.; these have respectively arrangements for wall-mounting and table-mounting. In one pattern the guard-ring is made tubular and acts as the support and by a simple adjustment the fan can be used on a table, wall, or ceiling. In the "Style" fan produced by Maico, Schwennigen a.N., the usual cast foot and swan neck are replaced by a chromium-plated base with two columns.



The "Prometheus" toaster and (right) curling-tong heater

The A.E.G. water heaters in all sizes from 30 to 120 litres, and of both low-pressure and high-pressure types with 3, 4 and 6 kW ratings, are all provided with a standardised form of flange carrying the elements. All A.E.G. household appliances are provided with built-in anti-interference devices.



Left: A composite boiling table for a hotel (Siemens) and right: an A.E.G. adjustable fan

The connection plugs moulded on to tough rubber cables shown by the A.E.G. are of particular interest for domestic laundry apparatus. The two-pin apparatus socket shown by Voigt & Haeffner is so arranged that the point of bending of the flex is variable, thus reducing cord breakages.

The A.E.G. has produced a new small refrigerator of 125-litre capacity, having an evaporator of stainless steel, a semi-automatic defrosting arrangement, and the door arranged with a novel catch so that it springs open very easily.

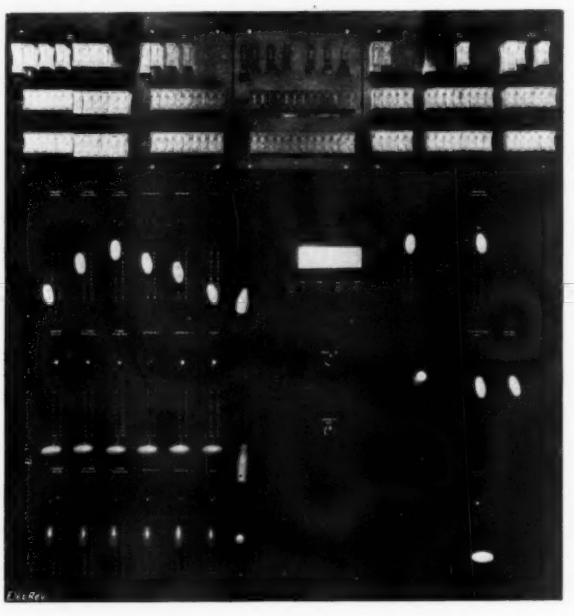
Projector Arc Control

Remote operation at the Astoria Cinema, Brighton

THE apparatus for operating the projector arcs at the recently opened Astoria Cinema, Brighton, is remarkable mainly because it can be placed in any convenient position in the theatre.

The control unit, comprising contactors, 150-A fuses (on both poles), paralleling switches, and resistance are all mounted as an integral part of the resistance rack. The paralleling switches for increasing the arc current are brought into use manually when conditions affect the amount of illumination on the screen and the 100-A remote operated contactors work in two stages. The overall dimensions are: height 4 ft. 6 in., width 1 ft. 2 in., depth 2 ft.

Only three 3/.029 v.i.r. cables are needed for the connection to the arc, *via* a three-way rotary switch on a local control panel measuring 9 by 10 by 5 in. at the rear of the projectors. On the first position of the switch a pilot lamp indicates that current is available; the arc is struck normally at 70 A. A second movement of the switch enables the arc to be brought to full luminosity with a current of 120 A normally or 140 A under adverse conditions.



Major stage and auditorium switchboard

Four complete units are provided in the projector room, two for the film projectors and two for the spot-lights. A part of the equipment is shown in an accompanying illustration.

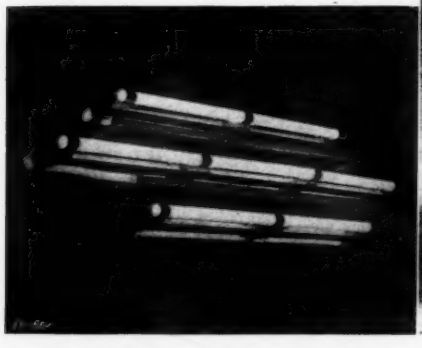
The main lighting switchboard has twenty-four switch and dimmer ways for stage lighting and nine for the auditorium and a further six live circuits. The dimmers are mounted in rows corresponding to the colour of the lighting and can be individually or collectively operated. Turning the dimmer handle through 90 deg. locks it on to the colour shaft, which is controlled by a colour master handle at the end of each colour row.

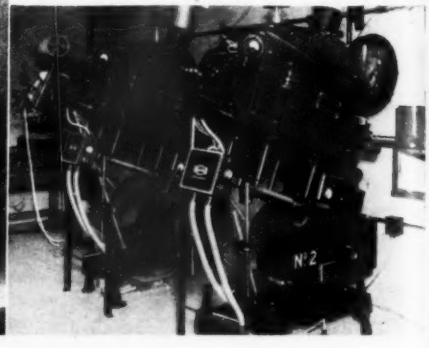
The fuses are mounted on "Sindanyo" panels and internal wiring is carried out by "Rockbestos" cable. The 37-ft. "Rotalux" rotating colour-screen batten is notable in that every compartment can be used to obtain any colour; this obviates the drawback of the ordinary type in which flexibility in colour mixing is obtained only by having every third or fourth compartment of the same colour.

As no dark patches appear between the "Rotalux" compartments, the batten can be hung close to scenery without causing shadows. Colours may be pre-determined and automatically brought into use as required. The batten is controlled by sash line from the stage, but it can be adapted for motor operation.

The stage equipment includes also two 35-ft. battens with chromium-plated reflectors and gelatine colour screens, wing floods, spotlights with prefocus cap lamps, and "baby spots" with 4½ dia. lenses for 250-W lamps.

In the auditorium several concealed balcony spots have been provided for 1,000-W lamps, and "Type L.66" gangway louvre lights have been installed. The arc control unit was designed by Major C. H. Bell, consulting engineer, and with the other electrical apparatus described was manufactured by the Major Equipment Co., Ltd., London.





Left: One of the roof lights under the balcony. Centre: a trough light which runs along the whole length of the ceiling. Right: The projectors showing local control panel

Rectifier Equipment at Farnworth

A NEW mercury arc rectifier recently installed at the Farnworth (Lancs) electricity works for supplying the tramcar and trolley-bus load is of the glass-bulb type manufactured by Bruce Peebles & Co., Ltd. It consists of two six-anode bulbs arranged in a double cabin cubicle, and is designed for a continuous d.c. output of 300 kW at 600 V with overloads up to 600 kW. The 10-kV three-phase 50-cycle supply is received at a motor-operated circuit-breaker which is arranged for electrical control from a synchronous motor-operated time switch. A Peebles oil-immersed transformer operates in conjunction with the rectifier for stepping down the h.v. supply to the required anode voltage. The secondary windings are twelve phase, six phases being taken to each bulb. The h.v. side of the transformer is provided with a tapping switch for ±2½ per cent. and 5 per cent. voltage tappings.

A wave-filter system is provided to ensure that the amplitude of the harmonics on the d.c. side is so reduced as to eliminate interference with telephones and wireless. This filter consists of a series choke coil connected in the d.c. mains with a resonant circuit connected across the mains; the latter consists of a condenser and choke coil tuned for the frequency given out by the rectifier. A system of regenerative braking is employed on the trolley buses.

The apparatus is controlled by relays which are arranged to operate when the d.c. voltage exceeds a predetermined value and a reverse current is being returned to the busbars due to the regenerating trolley buses. When these conditions occur the relays switch in a resistance of suitable capacity for the consumption of the reverse power and when regeneration ceases the resistance is immediately automatically cut out of the circuit.

Illustrations of this equipment appear on page 381.

THE training college for women teachers built at Ormskirk by the Lancashire County Council at a cost of nearly £200,000 possesses a number of important electrical features, foremost of which is undoubtedly the cooking equipment. The task of cooking daily for some 220 people, comprising the academic staff, students, and domestic staff, is no small order, and the consulting engineers and the educational authorities gave exhaustive consideration to the claims and costs of other forms of cooking before ultimately deciding upon the electrical method.

The equipment, which was manufactured and supplied by the General Electric Co., Ltd., comprises one cabinet oven, loading 12 kW; one triple-oven range with six hot plates, loading 26.8 kW; one fish and chip fryer, loading 24 kW; one carving table, bain-marie, and hot cupboard, loading 13 kW; one hot cupboard capable of dealing with sixty meals simultaneously, loading 7.2 kW; and one griller, loading 4.5 kW, giving a total loading of 87.5 kW. The equipment is in daily use for breakfast, dinner, and supper. Electricity is

The kitchen with 87 kW of electrical equipment

not required for the tea meal, and all water is heated by steam plant.

The Ormskirk Electric Supply Co., Ltd. (an associated company of the Lancashire Electric Power Co.), from whose mains the supply is taken, installed check meters to record the cooking consumption separately from the lighting figures, &c. Full and accurate information has thus been obtained, and the data have been carefully considered in conjunction with the nature of the meals and menus. A close analysis of the figures for a representative period of from the second week of October last to February 3rd, excluding Christmas and other vacations, shows that the average consumption of electricity per meal per person is about 0.18 kWh. In an institution of this character electricity is normally available at ¾d. per kWh for cooking purposes, and at such a price it will be seen that about seven persons' meals are cooked for one penny.

An electric dish-washer and an electric potato peeler, both manufactured by the Hobart Manufacturing Co., and a refrigerator, supplied by the British Automatic Refrigerators, Ltd., form part of the electrical equipment in the kitchen and domestic quarters.

We have commenced our description with the kitchen because the cooking equipment is the outstanding electrical feature, but it may be of interest to give some idea of the general design of the college. The kitchen and domestic quarters already referred to are at the rear of the central block of buildings which surround a quadrangle, with two projecting wings running parallel north and south of the main block. The two wings are linked to the central block by means of artistic brickwork. In all there are about 1,500 lighting points and 120 electric fire plugs provided throughout the whole college, and something like 60,000 yards of cable and 50,000 feet of conduit are employed.

The effectiveness of the lighting in all departments typifies the excellent way in which the electrical work has been handled from start to finish by the consulting engineers, Messrs. G. J. Gibbs & Partner, and the electrical contractors, Messrs. W. J. Furse & Co., Ltd., under the direction of the County Architect, Mr. Stephen Wilkinson.

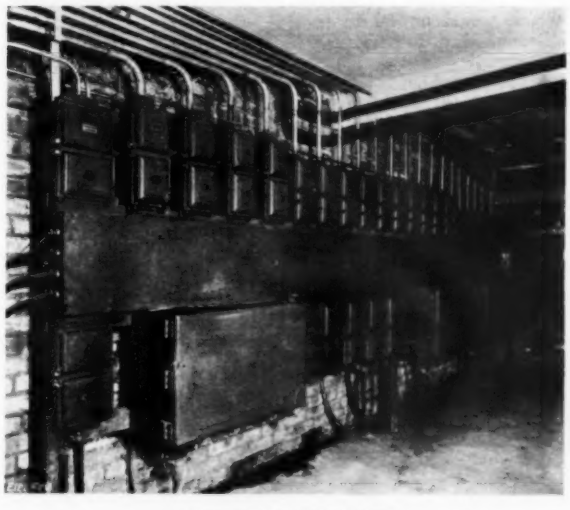
Stage Lighting Equipment

To touch on but one or two attractive lighting features: in the dining-room, situated in the central block, the arrangement of the fittings between the low ceiling beams gives the pleasing impression of concealed lighting. Then, again, in the assembly hall the mode of illumination from octagonal green-tinted domes set in the panelled ceiling is most effective. The oak panelled stage and rostrum and the frieze above with its decorative plaster work are shown to their best advantage by the skilful choice and placing of fittings.

For use in the assembly hall a specially designed portable footlight and batten and a mobile switchboard have been installed. This gear is completely removable so that normally the platform gives no indication that it can be used as a stage.

The feeder for the stage lighting consists of a four-core p.i.l.c., s.w.a. cable terminating under the platform in a triple-pole and neutral switch and interlocked plug. This can be coupled up to the portable stage switchboard by means of five-core trailing cable, the fifth core being used for earthing. The portable stage switchboard is mounted on rollers, and is fitted with the necessary switches, fuses and dimmers for controlling the stage lighting.

The footlight is made in sections to facilitate removal, and is arranged for three colours, each independently controlled by the dimmers on the switchboard. The batten is also made in sections, suspended from a continuous barrel, raising and lowering gear being provided to facilitate erection and removal. Four colours are provided on the batten, each independently controlled by dimmers on the switchboard. In addition provision is made on the switchboard for controlling two stage floods.



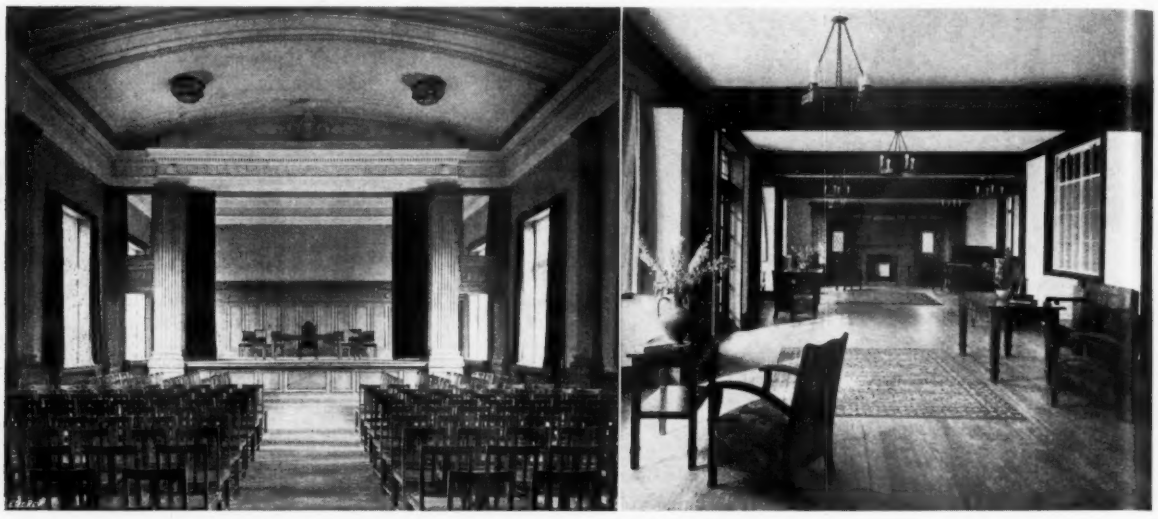
Some of the switchgear

Adequate illumination of the drives and footpaths has been provided by the installation of G.E.C. lighting pillars surmounted by opal spheres with 150-W lamps. This lighting is controlled by electrically rewound time switches arranged to switch on at dusk and off at 10.30 p.m. Hand operation is also provided for use in case of emergency such as fog, and, in addition, each pillar is fitted with a separate switch.

Fire alarm pushes have been installed in all corridors opposite the staircases, and each corridor is equipped with two fire alarm bells. These bells are transformer operated through relays, so arranged that on an alarm being given all the bells in that particular section will continue to ring until the relay has been reset by hand by an authorised person. A complete system of transformer-operated bells has been installed.

Two automatic passenger lifts and two service lifts are other valuable electrical facilities, and twenty-four synchronous clocks are in use. Power plugs are provided in suitable positions throughout the college for vacuum cleaners and floor polishers.

In the grounds of the college is a little unobtrusive building which houses the sub-station equipment of the Ormskirk Electric Supply Co.



Left: The theatre, the stage of which has special electric lighting. Right: One of the common rooms

A Paris Exhibition. By S. Henry Kahn

THE Paris Salon des Arts Ménagers of 1934 will be remembered as one of the most successful of any. This year there were far more exhibitors than for any previous show. Electrically, however, the exhibition was slightly disappointing for one expects to meet new ideas and improvements in such a show as this which gives great scope for ingenuity.

One or two new appliances, however, were worthy of note, particularly those intended for use in the small household. This is of the greatest importance, for up to now manufacturers have more or less concentrated on more ambitious machines which would appeal to institutions, boarding-houses, or at least to the wealthier public who can afford to indulge in the latest labour-saving devices.

A floor-polishing machine seen at the Paris Salon des Arts Ménagers

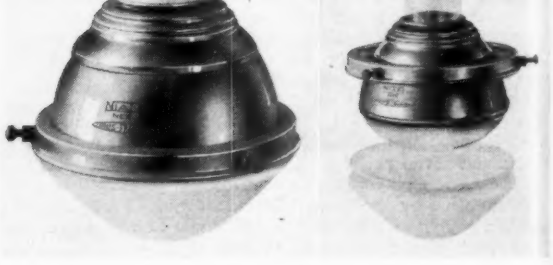
One of the most interesting dish-washers to be seen was a very small affair requiring only 30 W. This machine differs from others as it only washes six plates at a time. The smallest shown last year washed twenty-five plates, which was altogether too large for the ordinary family. Further, the construction and arrangement of this washer permits it to be used without the housewife putting her hands in the water.

The " Electro Indux " is a rather interesting apparatus for the heating of any vessel or metal object, especially curling irons, flat irons, toasters, &c. It transmits its heat directly to the pots or other utensils in use. The heating is extremely rapid and as the vessel or object to be heated is not connected to any wire there is no heating element to burn out. There is no danger of shock.

Among the larger articles the Cireuse Electrique, electric floor polishers seem to have been improved. One machine is balanced in such a way that the brush acts on the floor without the necessity of its being pressed down. The machine is not heavy. Unlike most other machines of this type, it waxes the floor itself as well as doing the polishing. There is no danger of vibration or shock as the motor is suspended.

A new lamp with many advantages was also exhibited. This has a globe of a special shape with a reflector sealed over the glass so that dust cannot get in. The lamp directs the light down where it is wanted and does not collect dust. The fitting is illustrated herewith.

There were several air conditioning plants to be seen and numbers of water heaters, but I failed to find anything novel in these. Manufacturers explained that they had decided to mark time for a while in order to allow the public to catch up with the latest novelties. The one aim is to reduce the prices of apparatus in order that the less wealthy classes may be able to take advantage of cookers, cleaners, and washers. This was particularly noticeable in cookers. This year there appeared to be a great fall in prices as well as an endeavour on the part of manufacturers to produce smaller models.



A novel enclosed lighting fitting

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Mercury-vapour Rectifiers

IN the paper which was read before the London Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION on March 5th, Mr. J. E. Calverley pointed out as a rough guide that for a rating of 1,000 A the costs and conditions of glass and steel mercury rectifiers were usually about equal.

The steel-tank type was not economical for smaller outputs; it had been developed for ratings up to 15,000 A per unit, the cooling-water consumption depending on the load, whereas the losses associated with the cooling of the glass type were more constant. The average life of the glass bulb was 15,500 hours, but some had run for 40,000 hours. Air-cooled glass bulbs rated at 500 A each had been on the market less than a year.

By suitably polarising perforated metal grids (through which the arc stream had to flow) surrounding the anodes control of the current flow and voltage was obtainable. This simple and reliable means of control had rendered the mercury rectifier the most versatile of all converting machines.

In reply to questions asked in the subsequent discussion the author stated that grid control did not decrease efficiency, since it allowed the rectifier to be rated up somewhat, so that one could get 5 or 10 per cent. greater output from it, due to the fact that it was much more secure against backfires. These could not be attributed to any particular cause. Glass bulbs seldom had de-ionising grids, but it was universal practice, he believed, to use them in heavy-duty rectifiers. Graphite anodes did not introduce impurities into the mercury. If gas were occluded from anodes, it was usually not in sufficient volume to impair the vacuum appreciably.

Concentration of Equipment

Mr. A. M. Browne remarked that "thousands of rectifiers" were working under grid control; he believed there were more in England than in the rest of the world put together. Since a number of glass bulbs could be used in parallel, why enclose all the anodes in a single steel chamber and risk paralysing the whole in the event of one section failing?

Mr. Calverley replied that he could not imagine anybody using twenty bulbs, twenty fans, and twenty ignition and excitation outfits when the whole of the equipment could be put into one unit; the efficiency would not be the same. For a large steel-tank rectifier there would probably be 3-kW loss in auxiliaries, whereas if ten bulbs were used there might be 20-kW loss.

The material used for the grids in the steel-tank rectifiers was Armco iron, which was very pure, and he did not think there was any disintegration. Grid-controlled rectifiers were running in parallel with plain rectifiers, and no trouble had been experienced; he did not know that there was any increase in harmonics under those conditions. Mercury rectifiers were also working in parallel with rotary convertors.

Mr. J. E. Calverley

Mr. E. Gallizia said that the glass-bulb type had the advantage that it had no pumps and no complications in the way of water-cooling. A good output for a glass-bulb rectifier was 650 A. Eventually a pumpless-steel rectifier would prove to be the best all-round job. A steel tank would carry an overload a little longer than a glass bulb, because of the extra mass of the tank. Most backfires were due indirectly, if not always directly, to temperature, and if a certain mercury-vapour pressure were exceeded the rectifier would backfire. If protection against backfiring were sacrificed better cold starting could be secured.

Mr. A. G. Hilling said he understood that as the load was reduced the power factor went down, which would mean constant current, so that from the point of view of the mains engineer there would never be a light-load period. Would it be possible to install a.c. motors and supply them off d.c. mains by means of inverters; then, when the a.c. mains came into use, the inverters could be taken out? Mr. Calverley said he did not intend to say that the power factor went down in proportion to the load, but in proportion to the reduction of voltage. If a rectifier giving 550 V at full load was compounded and gave 500 V on no load, 10 per cent. down, the power factor went down 10 per cent. roughly. When rectifiers were run inverted a wattless component had to be supplied to the load from some other source; the rectifier could not supply the wattless current.

The Rebirth of Electricity

IN the Faraday Lecture, delivered at the INSTITUTION OF ELECTRICAL ENGINEERS in London on March 15th, Mr. Clifford C. Paterson demonstrated how the science of electrical engineering was born again when the physicist showed how electricity could be liberated from metal, in which state it had potentialities of which no one had dreamed. Just as physiologists learned that disease could be envisaged in terms of isolated germs and their life history, so the physicist found that electricity could be thought of in terms of the individual electron, its habits, and affinities.

Two of the main reasons for the practical usefulness of electricity were its transportability and ease of control. In the latter respect the free electron had of late given the engineer new and extraordinary power. It had revolutionised many things already and there were many more surprises in store.

The secret was that a stream of free electrons, whether in a

Selfridges are using 350 kW of extra lighting during their "birthday celebrations" raising the total for their buildings to 2,250 kW. Some of this special lighting is illustrated, the right-hand picture showing a pretty illuminated cascade

vacuum or a gas, could be manipulated with such facility that the electrical energy output could be increased or decreased at the rate of millions of times per second, or, alternatively, as slowly as desired, and no limit was set to the amount of energy which could be so controlled. Further, while the agency which imposed this control on the electron stream was usually itself electrical, it was possible to make light, magnetism, or heat the controlling agencies.

Much of what we saw and heard consisted of very rapid vibrations and complicated oscillations, of which the eye and ear were unconscious, although sensitive to them; only their mass effect was transmitted to the brain. To faithfully reproduce and transmit these high-speed fluctuations exact electrical copies of them must be made; this was done by suitably controlling a stream of free electrons. Normally the electrons were confined within metal conductors. If, however, a portion of the circuit (a thermionic valve cathode or filament) was heated electrons would emerge freely therefrom, like water soaking through a porous section of hose pipe. The heat liberated the electrons from the interior of the wire, and they swarmed around in a thin layer on the outside surface ready to move elsewhere when attracted away by externally applied electrical forces exerted by another metal electrode.

The control was exercised during the instant the electrons travelled between the two electrodes, causing them to flow and ebb, accelerate and slow up, reverse or oscillate, a frequency of three thousand millions per second being attainable. The photo-electric cell was another electron liberator, but in this case they emerged from a sensitised cold surface (cathode) when exposed to light and were collected on the anode. Such cells were capable of receiving over 300,000 impulses per second, *i.e.*, the duration of exposure to the activating light ray was only 1/300,000th of a second.

The ways in which these devices were used for the amplification, conversion and reproduction of sound and speech; for television; for the automatic control of industrial and other processes, &c., were explained and demonstrated.

A Disturbing Enigma

In spite of numerous and diverse applications, the lecturer proceeded to point out, the electron was not understood to-day so well as it was thought to be three or four years ago. Nevertheless, we knew its speeds of travel and its weight as a travelling missile. We knew how many there were in any given quantity of electricity and the exact number which went to form the elemental structure of every known substance; and we also knew that it was only one hundred millionth of the size of the smallest particle whose shape the most powerful microscope would reveal. But there was one very disturbing enigma about the electron: we had difficulty in satisfying ourselves as to its form and substance.

It often behaved as if it were a solid and definite particle, but under other conditions its behaviour was such as to make it necessary to picture it as a minute packet or group of undulations or waves, and the puzzle was that it appeared to be entirely indifferent whether it had the particle or the wave characteristics. Electrons, like light, acted at a distance and therefore they had to be regarded as waves. But if, when travelling in its wave character, an electron arrived anywhere or collided with something and its position was momentarily located, it automatically assumed its particle character and behaved like a definite and solid object.

Travelling and Arriving

The modern idea of probability was that so long as any travelling thing had not arrived it had only a probability of arriving; all probabilities were determined by wave functions. But once it got there, there was no longer any probability about its being there; its presence was a fact, and facts behaved like particles.

So there was no real inconsistency about the dual aspect of the electron, the freeing of which had introduced a new technique to the art of electric lighting. The incandescent lamp confined electrons to the filament, causing them to crowd together so as to heat the wire sufficiently to emit light. If the electrons escaped from the wire the lamp deteriorated, but if the glass envelope was filled with suitable gas mixtures the escaping free electrons collided with the gas particles (at speeds up to six million miles per hour) so becoming brilliant and highly efficient light sources, *i.e.*, luminous gas-discharge tubes.

Cold-cathode tubes needed the application of high voltage to induce the electron stream, but a hot cathode produced a more copious stream at low voltages and also enhanced the brightness of the light, the colour of which was governed by the composition of the gases in the tube. Some of these luminous tubes produced more than twice the amount of light emitted by a filament lamp of equivalent wattage.

The Noises Which Machines Make

THE paper on the measurement of noise, with special reference to engineering noise problems, by Messrs. B. A. G. Churcher, A. J. King, and H. Davies, to which reference was made last week, was discussed at the Institution of Electrical Engineers in London on March 8th.

Dr. A. H. Davies said that the authors had redetermined the threshold of hearing, confirmed similar work done elsewhere, and made a definite contribution to the subject. He was in strong general agreement with their procedure and arguments. At the National Physical Laboratory extensive use had been made of the decibel scale, and he feared that the authors' use of the subjective balance scale would lead them into difficulties. Present terminology was unfortunate, since the decibel could have a double meaning, *i.e.*, loudness and power level, which might be extremely misleading.

Mr. A. J. King, one of the authors of this paper, is here seen using an early form of aural-balance noise-assessing apparatus developed by the Metropolitan-Vickers Co.

Mr. W. West considered the collection of subjective data to be a branch of statistics not related to facts but to impressions or opinions. He preferred to regard subjective data as being peculiar to the technique employed. In Post Office room noise and quantitative tests some techniques of measurement had been found to give more definitely repeatable results than others.

Direct and Reflected Sound

Mr. A. B. Howe said it remained to be seen whether the authors' relation between loudness and decibels above threshold would prove to be more reliable than other bases of calculation. He was surprised to learn that filament control was used in the authors' standard tone producer, and suggested that the direction in which the microphone faced would have an appreciable effect, since part only of the noise being picked up would reach it directly, the remainder being reverberative. B.B.C. studio tests had indicated the indirect intensity to be five times the direct. He thought the effect of enclosing sound in a building (sub-station) would be much greater than the authors had suggested.

Pure or Complex Reference Note?

Mr. W. E. M. Ayres was of the opinion that the threshold of hearing was of little consequence so long as one agreed upon a starting point. He was in definite disagreement with the authors relative to the loudness scale. The decibel scale might not be perfect, but it was much better than the loudness scale, which so compressed the region in which engineers were interested as to render it useless. Whenever possible he preferred to use a masking method with a complex reference note. A pure note was not desirable for general testing, but only for laboratory work when calibration was necessary. An annoyance meter was not yet available, but the audiometer had been the means of quickly settling many complaints.

Mr. H. Davies, another of the authors of the paper

Mr. D. B. Hoseason said that he had tried hard to use the decibel scale. The result was that he would strongly advise the use of some sensation scale when dealing with the layman if one wished to avoid becoming involved. They were mixing up stimulus with sensation, and it was quite wrong, in his opinion, to built up a scale of sensation on a base of stimulus in this manner. With the help of

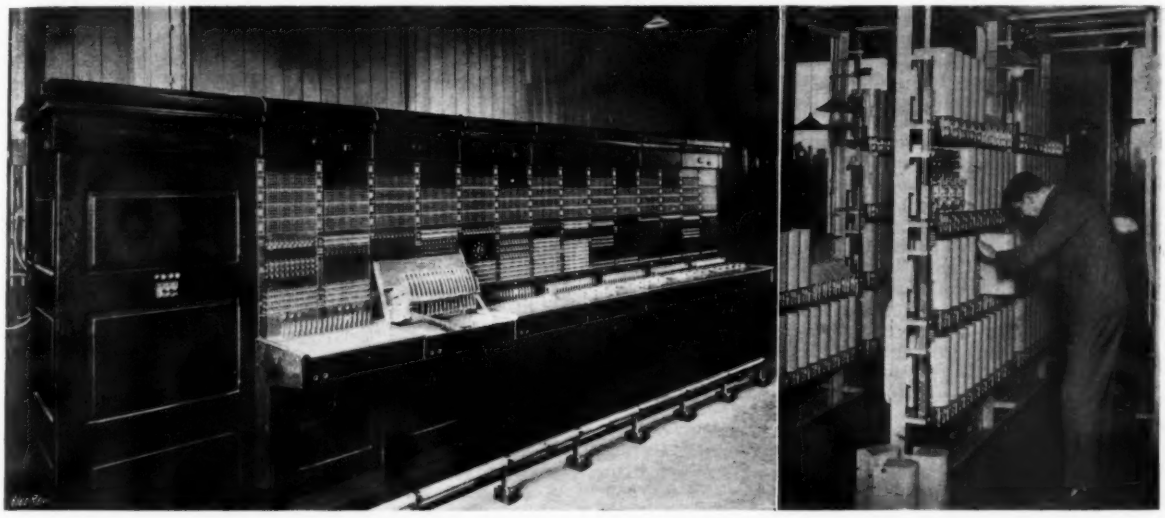
such papers as the authors' engineers would soon be able to give noiselessness guarantees in the same way as they now guaranteed efficiency and performance.

Mr. E. T. Norris pointed out that the authors had put forward a new scale, which would upset present notions and ideas, without encountering serious criticism. A portable instrument might be suitable for measuring noise from a point source, but it would not be so easy to use it for investigating, say, a really large transformer, and especially the top tank cover plate. Noise caused most annoyance in residential districts, especially to people who slept above ground-floor level. Therefore the distance and height at which the noise was measured were important. His firm used a specially equipped motor van and analysing equipment mounted on a tall tripod stand, so that it could be placed at the correct height and distance.

Mr. R. A. Bull referred to an objective method of noise determination recently devised in America, which had been found quite satisfactory. He had not encountered such discrepancies as the authors seemed to have experienced. In the reduction of very high noises every decibel counted. Mr. D. A. Oliver stressed the extreme value of the authors' relation between loudness and decibels above threshold, remarking that the relation between stimulus level and sum of just perceptible increments had not been checked by the practical results of experience.

Mr. A. C. Hutchinson said he came to criticise the paper, but the discussion showed that it was the art which needed criticism. The paper stood out as a lighthouse, and the subjective scale of noise estimation was outstandingly new. From the mechanical engineer's point of view the decibel scale was quite ridiculous. Loudness bothered many people who could not get hold of the first principles involved in such horrid complexity.

On account of the lateness of the hour the authors reserved their reply to the discussion.



New telephone exchange equipment is now being installed at Paddington Station. It consists of a manual board for incoming and outgoing calls and an automatic exchange for intercommunication, &c. **(See page 383)**

Electric Signalling on Railways

THE case for lighting and operating railway signals electrically is argued by Mr. C. M. Jenkin Jones in the paper which was read before the Institute of Transport in London on March 12th. From the operation point of view the author maintains that reliance on coloured lights instead of semaphore arms and the focusing of the signal on a level with the driver's eye should receive a cordial and unqualified welcome.

Multiple-aspect as against two-position signalling should be welcomed in principle, as it facilitates the quick operation of traffic and increases the capacity of the line. At the same time operating officers should keep a wary eye on proposals for additional aspects and the complication of a mixture of lights, and a very clear case should be made out for the need for such refinements before they are generally adopted. Risk of confusion due to conflict of the meaning of signals in multiple-aspect colour light areas and semaphore areas, respectively, should be avoided by ensuring that all colour light signals have the same meaning according to the lights they display in whatever area they are provided.

A reserve light of some kind must be provided, as it is not satisfactory to rely on a single filament. The present modern searchlight or other reflector type of signal provides such definite advantages from the point of view of sighting that it should be adopted as the standard. If found practicable a double filament signal lamp should be used, but if this is not found to be satisfactory in practice an auxiliary red light should be provided which would come into operation automatically on failure of the main signal light.

The passing of red lights should be avoided so far as practicable. From this point of view, red marker lights and red ground signals for shunting purposes should not be adopted, and the signalling of junctions should be simplified so that one signal only, with direction indicators, could be provided for diverging lines. A colour light signalling system of the type outlined would be economical to install from the signal engineer's point of view and would be of such a simple nature that drivers would "learn the road" quickly, and, in this respect, the cost of teaching drivers, which, under existing signalling methods, is a very costly item, would be reduced to the minimum.

While agreement on general principles is desirable, it would be a vital mistake to insist on standardising all detail at the present time, as the need of the moment is to foster further experiments and improvements rather than to regard the existing level as the highest which can be attained.

A Remarkable Engineering Feat

THE March 6th meeting of the London Branch of the Association of Mining Electrical Engineers attracted a large attendance to hear Mr. P. V. Hunter's address, which was illustrated with cinematograph films, on the manufacture of extra-high-voltage cables and the erection of the River Thames crossing of the 132-kV grid line.

In the course of his remarks, Mr. Hunter said that cable manufacturers had striven to devise some method of reproducing, in the compass of a few weeks, the "ageing" effect of years of service; and to-day the life test of a type of cable was regarded as one of the most important of those it had to undergo. Methods of drying, impregnating, and sheathing, quality of paper and compound, details of processes and types of plant had all received the most searching scrutiny and many had been improved to an almost incredible extent. For example, the reduction of the power factor was perhaps the most striking, since in this instance the improvement could actually be reduced to terms of pounds, shillings and pence.

Four years ago the power factor of 66-kV three-phase cables was of the order of 0.005, whereas to-day such cables were being produced with a consistent power factor of the order of 0.003. The saving so effected was 775 W per mile; and in a system comprising 100 miles of such cable, assuming a cost of three-eights of a penny per kWh. this represented £1,000 in a year's working.

The Thames Crossing

The erection of 132-kV lines, and the towers supporting them, across the Thames was a fitting memorial to British engi-

neers. Each supporting tower consisted of over 15,000 separate pieces assembled on the site, totalling about 300 tons of British steel. For the crossing between Dagenham and Abbey Wood the total distance between towers which had to be spanned was 3,060 ft. At a distance of 1,500 ft. back from each of the crossing towers an " anchor " tower was erected to which the seven conductors could be made fast.

The span, as such, was not exceptional, but the lack of high ground was a severe disability, the towers being necessarily sited virtually at river level. Hence, the towers had to be carried to a height of 487 ft. to give the necessary clearance of 250 ft. for shipping.

The sag of the lines alone was 170 ft., corresponding to a tension of over 6 tons per conductor. Under hurricane conditions the tension might rise to very nearly 12 tons per conductor, and, since the conductors ran over suspension saddles on the main towers and were secured at the anchor towers, the latter had to be designed for a possible tension of as much as 80 tons. Special " snail " type clamps were designed to enable the conductors to be made fast on to the anchor towers, the spiral of the " snail " taking up the major proportion of the total tension, and the locking clamp the remaining fraction.

The maximum compression on each leg of one of the crossing towers under full load conditions was in the neighbourhood of 200 tons. The footing concrete blocks were carried on 60-ft. piles of reinforced concrete and provided with steel bases to which the tower members were bolted. Each conductor consisted of eighty-four strands of phosphor bronze and seven of cadmium-copper, made in one single length of approximately 6,400 ft., or nearly a mile and a quarter. The transmission lines to which the crossing conductors had to be connected were of normal steel-cored aluminium, and in order to eliminate all possibility of electrolytic action at the junction of the two metals, special screwed connectors were inserted in the jumper leads, one half being of bronze and the other of aluminium, the junction being protected from atmospheric action by a fibre washer.

Seven conductors, comprising two three-phase circuits and one earth wire, were carried over the sheaves on one tower and then laid across the river and allowed to lie on the bottom. This operation was carried out at high tide, the time taken for the crossing being only 14 minutes. For two hours on each of seven consecutive days all traffic up and down the river was stopped at low tide, and one of the conductors pulled up each day to its position on its sheave on one of the tower cross-arms.

Why Not Use A.C. on Board Ships ?

THE use of electricity for driving ships' auxiliary machinery is increasing at a rapid rate. Ships carrying frozen and chilled cargoes need a generating capacity of from 1,000 to 1,600 kW, the C.P.S. " Duchess " vessels 1,800 kW (the *Empress of Britain* has 2,800 kW), Orient liners 1,350 to 1,500 kW, P. & O. ships 1,500 to 2,600 kW, and the Cunard liner (No. 534) now being built will need 9,100 kW.

In a paper which was read before the INSTITUTE OF MARINE ENGINEERS in London on March 13th Mr. W. J. Belsey questions whether marine engineers are proceeding on the right lines in continuing in most cases to use d.c. The author advocates instead the use of a.c. machinery on account of its relative cheapness, reliability, efficiency, robustness, and low maintenance cost, while for such domestic applications as lighting, heating, and cooking he claims that a.c. possesses great advantages.

These are not waste gases which are seen issuing from the Battersea power station but water vapour produced during the treatment of the waste combustion products

The advice to " change for something better and cheaper " is based on the squirrel-cage induction motor, which is the simplest type made, and is applicable in a very wide field. In a large passenger vessel with a total of 288 motors, not fewer than 266 could be of the squirrel-cage type, which is the cheapest to make, the most robust, weighs less, is more efficient than any other type for a given output and speed, and will stand a lot of " punishment." Three or four definite speeds are obtainable by means of a change-pole winding, and a wider range with fine graduation is obtainable by the use of a.c. commutator motors.

Will the marine engineer be prepared to drop unnecessary speed adjustment for the sake of getting a mechanically robust motor and at the same time eliminating a large amount of bulky and costly control gear? Of every 100 motors made in this country eighty are a.c., and d.c. applications are gradually dying out, not because a.c. is standard, but on account of its inherent advantages.

The squirrel-cage motor lends itself rather well to having built-in speed-reducing gears in the end shields, and for duties demanding a great starting torque a.c. slip-ring motors are effective. Deck machinery and winches would require special consideration, but, since there are many a.c. lifts and cranes, this problem should be capable of solution. Some ships have already been equipped with motor-generators for operating constant-current deck plant.

The possibility of using transformers for sub-dividing the lighting, heating, and cooking services would be advantageous and greatly facilitate the clearing of earth faults. Some 90 per cent. of the auxiliary motors on a ship could be of the squirrel-cage type; costly and bulky control gear would be eliminated. The smaller machines could be switched on direct, while a common starting compensator with local push-buttons would serve groups of larger motors. The efficiency would be 2.5 per cent. in favour of a.c., and in the case of a large passenger liner chosen as an example the weight of generators, switchgear, cables, and motors would be 285.5 tons, or 105.8 tons less than the d.c. equivalent.

The capital cost would be 12.5 per cent. in favour of a.c., quite apart from the lower upkeep and renewal cost of low-voltage lighting and cooking and the substitution of transformers for small motor-generator sets for bell ringing, signalling, and similar purposes.

Should Patent Protection be Extended ?

INVENTION in relation to national welfare and legislative control was the subject of an address delivered by the president, Sir Ambrose Fleming, at the sixth annual general meeting of the TELEVISION SOCIETY in London on March 14th.

Mechanical and scientific inventions were of great utility and created new industries, Sir Ambrose pointed out, but they might also injure older industries and often created unemployment. The replacements which invention brought about forced one to consider how far mechanisation was responsible for the large-scale unemployment which afflicted the world to-day. A more basic cause was probably the waste of wealth which enmity involved, humanity not yet having learned to live as one society instead of as a collection of contesting rivals.

Invention, however, required guidance and control, and it was difficult to introduce new methods and ideas when any one branch of activity had become centralised in a few hands or petrified by becoming a Government monopoly. The disadvantage which arose from erroneous or premature legislation intended to control invention was illustrated by the history of telegraphy, telephony, electric lighting, and wireless telegraphy. Television was now also in the grasp of the same power, and it was not given a chance to prove its utility until 11 p.m., when few people had any use for it. Premature legislation could easily cripple a nascent industry and bind it in bandages of red tape. It was beyond defence that an invention which was not dreamt of at the date of a certain Act of Parliament should be permitted to be controlled by that Act.

In conclusion, Sir Ambrose advocated an extension of the period of patent protection, at present fourteen years in Great Britain. An invention was of no use to the public until it had been commercialised; this generally required time and great expenditure, which it was not possible to secure without some reasonable prospect of return upon the capital before the period of patent protection elapsed.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

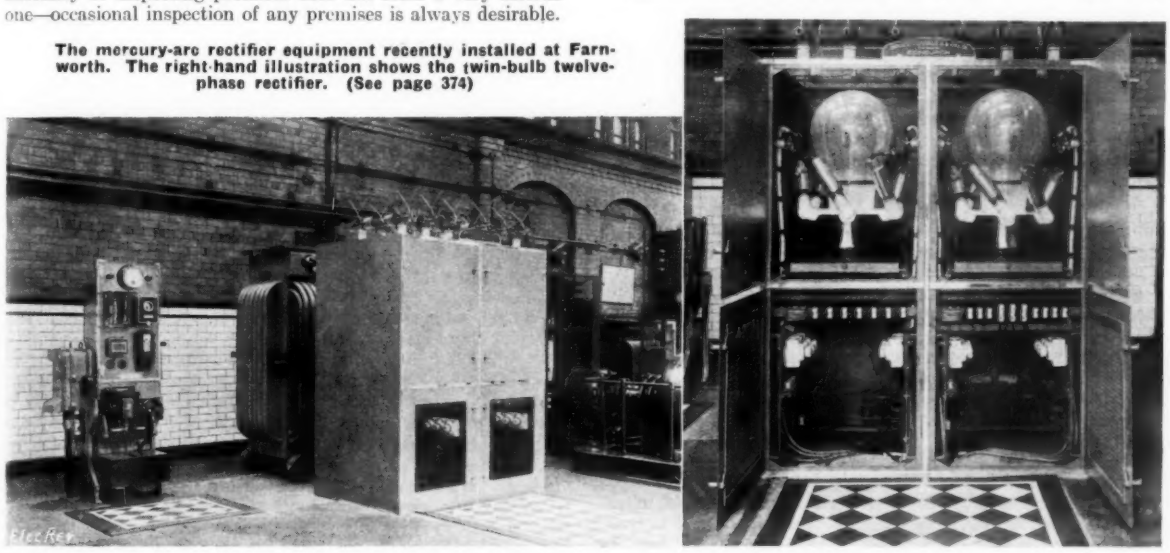
Suggestions for a Two-part Tariff

My letter, which appeared in your issue of February 16th, has already evoked a good deal of criticism in addition to that of your two correspondents in the issue of March 2nd. May I ask for more space in order to express my views of this criticism?

I admit that the scheme as put forward might tend to an unreasonable restriction of the lighting wattage installed, and to deal with this I suggest that the tariff should be offered only where the installed load is "reasonable," the alternative being the flat rate. This would probably only be necessary in the case of new consumers. I do not suggest that my tariff deals with the difficult question of maximum demand and peak load. It seems to me that the solution can only be found by increasing the domestic load with a consequent increase in diversity factor. I do not think that lighting for temporary illumination purposes need be in any way restricted.

I gather from conversations with meter manufacturers that no difficulty would be experienced in constructing a prepayment meter to suit this tariff. The objections raised as to the necessity of inspecting premises does not seem a very serious one—occasional inspection of any premises is always desirable.

The mercury-arc rectifier equipment recently installed at Farnworth. The right-hand illustration shows the twin-bulb twelve-phase rectifier. (See page 374)



Persons who deliberately set out to cheat must in any case be dealt with by special methods.

It would seem to me that a tariff based on lighting wattage installed must be more equitable than one based on floor area or rating assessment, and my tariff should be more acceptable to the consumer than either of the others, particularly as he is only asked to pay for what he actually uses. The whole point of this tariff is that the fixed charge is obtained in a manner fair to the consumer, who perhaps in the past has not always received the consideration to which he is entitled, and which, as a rule, is extended to him by our opponents. We find that slightly under 40 units per 100 W installed seems to be a fair figure as an average, but I shall be glad to hear of the experience of other rural undertakings.

It will indeed be difficult to find a tariff which is simple, protective to the undertaking, fair and acceptable to the consumer, and thief-proof, and I only humbly venture to hope that my suggestions may be of assistance in arriving at this much-to-be-desired goal. The importance of the rural domestic load seems to be daily more recognised and appreciated, and it has been suggested, I believe, that the future success of the grid will depend very largely on this load, which some simple and equitable form of tariff should do much to encourage, not only through new consumers, but through the extended use of electricity by those already connected.

N. Frank Nalder, *Manager*,
Burford Electric Light & Power Co., Ltd.

Burford, Oxford, *March 7th*.

A Middlesex Appointment

I consider that your correspondent "Unemployed Electrical Engineer" has no reason to complain with regard to this particular vacancy, as the Middlesex County Council had the courtesy not only to acknowledge all applications but to notify all applicants as to the decision at which it had arrived.

If he is seriously seeking an appointment he must reply to many advertisements, and if his experience is the same as mine, after having despatched his application he will hear nothing further in nine cases out of ten. Why then should he accuse this authority of wasting his time and money and further criticise its method of filling the vacancy? An application to the I.E.E. or the British Executive Employment Society would only have produced candidates who had their names registered, and would not have produced the selection which a public advertisement did.

While I sympathise with your correspondent on the fact that he is unemployed, I would ask him to bear in mind that there are engineers in positions who are anxious to better themselves, and it is only through the medium of public advertisements that they are able to do so.

March 7th. Unsuccessful Applicant.

What E.D.A. Might Do

We all hope great things from the new E.D.A. and, what is more, we need all the help that it can give us, but to be successful the Association might very well adopt some new methods. The public speaking competitions have opened up a good seam and they might be followed by a series of competitions for publicity staffs in which useful suggestions would be asked for.

For instance, when exhibition houses are opened and run, a number of problems arise which London headquarters cannot solve. How are cooking demonstrations to be dealt with in modern houses where the kitchenette is so small that lectures to an audience are out of the question? What about washing and other demonstrations in similar circumstances? When the opening ceremony takes place should a tea be provided for the Mayor and councillors who grace the proceedings? In actual practice it may be found that His Worship does not wait for tea, but immediately leaves for other business. In such cases the tea ought to be omitted.

What about electrically cooked food? What types of food are best for exhibition purposes? Should the food be sold or given to the demonstration staff? Are wiring contractors and other tradesmen to be roped in to the business, paying their share of the advertisements? Sometimes it may be found that the contractors feel aggrieved if they have to help pay for the supply authority's exhibit, and sometimes outside tradesmen who join up demand more than their fair share of publicity. E.D.A. might obtain reports from those who open exhibition houses with copies of their advertisements, &c., and when anybody contemplated one, they could obtain a folder giving information based on actual results elsewhere.

Such a development would also prevent flaws which occasionally occur in E.D.A. advertisements. One block issued shows an iron run off a key-switch holder. As the iron has to be switched on and off frequently, to keep the temperature right, this holder would force the housewife to jump on to a chair every few minutes or so to operate the switch—an awkward proceeding. If the supply were d.c. the key-switch would probably arc over. Advertisements of this kind are an invitation to contractors to install such fittings, and the supply authority can scarcely complain if a contractor acts accordingly.

Some of the cooking advertisements have also not appealed to the E.A.W. The booklet which showed a lady cooking, handling meat when it was spurting out grease, and washing out the oven in her outdoor clothes with no overall on did not appear very reasonable. The final picture, which showed her going out shopping in the same clothes, with grease spots on them, did not meet with approval. The effort smelt of the office and not of the kitchen.

Humour in advertisements is a dangerous weapon, but effective if it is just right, especially if illustrations by good artists are used. C. Turnbull,

Tynemouth, *March 6th.* *Borough Electrical Engineer.*

Self-contained Saucepans

With reference to the letter from Mr. H. Wilson, A.M.I.E.E., on the above subject published in your columns last week, we are afraid that we cannot help by offering to supply a self-contained electric saucepan, but, apparently, it is not generally known that eggs can be boiled in six minutes from switching on a boiling plate. It would perhaps be more correct to say that the eggs are steamed, as only enough water to cover the bottom of the saucepan is used.

Although our instruction cards have made this point clear for nearly six years now our demonstrators find, in visiting various districts, that the method is still not known, and some electric cookers are being returned from hire because the public are not fully acquainted with this and certain other useful facts which would enable them to get the best out of their cookers. General employment of demonstrators by supply authorities would overcome this to a large extent, particularly if these demonstrators cared to pick up and make use of the tips which manufacturers' demonstrators could give them.

Jackson Electric Stove Co., Ltd.,

London, S.W.1, *March 12th.* S. C. Hurry, *Sales Manager.*

Engineers and Economics

I keep seeing notes and queries in your paper as to why purchasing power does not keep pace with production. The answer is really quite simple, though I admit that at first it appears absurd, that is—that rates of remuneration have risen too high. The cure is obvious, simple, disagreeable, but effective—a reduction in rates of remuneration. There is no other cure, though this may be disguised, for instance, by giving everyone a ten per cent. rise, and reducing the value of money by twenty per cent.

Much of the trouble is due to the world-wide fallacy that high rates of remuneration increase purchasing power, whilst the fact is that this reduces purchasing power. The reason this is not at once apparent is due to increased efficiency of production and because all wages do not go up and down together. Supposing one person has his wage doubled, obviously he is about twice as well off. Supposing, however, everyone has his wage doubled. As the cost of things is mostly made up of wages, salaries and the like, prices would be doubled and apparently we should all be as we were. But another factor now comes in—twice as much money is now required to finance transactions—increasing the amount required and increasing the demand for money. The amount that has under these conditions to be paid for money promptly goes up. The net result is that the persons to benefit by this all-round increase in wages (in which I include all giving service for money) are not the workers, but the persons with money to lend.

When it is realised that increased rates of remuneration can never catch up with the increased cost caused by this, we shall make the greatest advance in prosperity that there has ever been. The difficulty in realising this is due to things economic often going into reverse after a temporary move in one direction, and it is necessary to look more than one length ahead to ascertain ultimate results. The failure to do this results in the statement so prevalent, that our economic troubles are due to "the disastrous fall in prices," whereas the *real* disaster was the *rise* in prices, which were given such a boost by the Great War.

Previous wars have resulted in similar rises, but after a sharp period of painful readjustment after the wars a stable level has been reached, and a greatly increased prosperity built up from this stable foundation. This adjustment has been prevented since the last war by an increasing host of "protective" organisations (self before service)—trade unions, employers' federations, teachers' unions, property owners' associations, &c., all to some extent successful in "looking after the interests" of their respective members—in other words, getting a bit more out of the community than they would obtain by fair free open competition, the host of non-productive officials of these organisations all being carried by the producers.

Mobility and the will to do a little bit more for others in return for a little bit less for ourselves would soon cure all our economic troubles, but there is little evidence of any considerable move in that direction, and naturally political action is of little use; a politician to be popular has to tell his constituents what he thinks they like, and the plain unvarnished truth is not liked. Meanwhile the tragedy of unemployment and want continues whilst we chase shadows and think that if all our 10s. notes became £10 notes we should be rich.

Sheffield, *March 12th.* W. E. Burnand.

"N. R. T.'s" letter puts me in a somewhat difficult position, since a technical exposition of the reason for chronic under-consumption would take considerably more than the half-column he mentions. I take it, however, that it is unnecessary to prove to "N. R. T." or any other of your readers that under-consumption exists to-day in view of the desperate methods which have to be adopted by different concerns in order to get rid of their output of manufactures, of which the price and quality are continually lowered in order to meet the diminishing purchasing power of the public.

That this under-consumption is chronic can hardly be doubted when it is realised that the output of almost any industry in the world could be multiplied six times with existing machinery and available personnel, and that actual productive power has never been used to the full except during the War, when, for the first time, production was our objective. Despite the sabotage of machinery in the interests of price-raising, the potential productive power due to advances such as electrification has considerably increased since the end of the War.

"N. R. T." seems to assume that the desire of the consumer for goods (for the satisfaction of which desire he lacks only the money) is a good and sufficient reason for the production of those goods. This is a commonly-held view, but, nevertheless, a fallacy, and results from the now untenable assumption that the object of our system is production for consumption, or even for the making of a money-profit. An analysis of our present methods of finance will demonstrate that unless bank credit is being expanded the profit of one concern is necessarily the loss of another, and, further, that only by an increasing expenditure on capital account, *i.e.*, for further productive power, can we consume our existing goods produced by our present methods.

Hence, so long as the misapplication to our age of real plenty of a mediæval credit system based on, and intended to perform in, a state of scarcity, continues, so long must "N. R. T.'s" firm play a game of beggar-my-neighbour in competing for the consumer's inadequate purchasing power. It should further be noted that if purchasing power was sufficient to pay for all goods produced, there would be no necessity for our high-speed super-salesmen, hire-purchase, or even advertising in the form familiarised by business obliged to function in our present artificial conditions.

Failing the efforts of engineers, there is, however, always the possibility that by various output-limiting schemes our financial experts may succeed in producing those conditions of actual scarcity in which alone their economic system can function. B. Wood.

London, W.1, *March 13th.*

Electro-thermal Apparatus

Mr. Baxter's comments are very interesting and practical. The boiling plates on electric cookers, whilst a considerable advance on the original types, still leave much to be desired. Numerous tests clearly indicate that the open radiant type boiling plate offers advantages in efficiency as compared with enclosed types, and dispenses with the necessity of special pans, &c. Boiling-over troubles and high maintenance charges were no doubt responsible for the more extended use of enclosed plates and special utensils. It was a bad compromise, and with the increased knowledge and application of high temperature alloys, there is now every indication that open type plates for electric cookers will ultimately take the lead, and result in a more extended use of electric cooking. Three-heat switch control is only a compromise, and until we can give a quicker speed of operation and a wider regulation of temperature the "gas ring" will still be the favourite of the majority. To supply an electric kettle with a cooker is surely a tacit admission that for boiling water the hot-plate leaves a good deal to be desired.

The open metallic hot-plate fitted with a transformer giving a low voltage, has in my opinion given the utmost satisfaction. Its glowing effect is to be commended and obviates the plate being left on inadvertently. I am sure this type of plate will find increasing favour, but I cannot understand why the makers of this plate still adopt the three-heat method of control. Surely it would be possible at very little cost, to supply the transformer with tappings on the primary side, to give through a selector switch a very much wider control than is possible with three-heat switching.

For domestic heating the radiant type fire of high radiant efficiency—in one case 77 per cent.—will find the most favour when better appreciated. Most systems of low temperature

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Low-voltage Boiler-griller

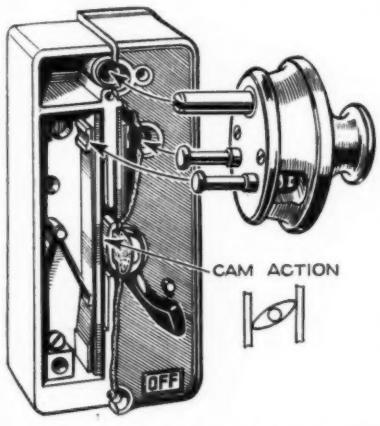
The 2-kW "Superspeed" griller-boiler produced by the REVO ELECTRIC CO., LTD., Tividale, Tipton, Staffs, which was briefly referred to and illustrated in our issue of February 16th, embodies the same transformer-feed principle as that employed for the "Superspeed" boiling plate, but modifications have been made to suit the dual purpose, and the new unit is rectangular instead of round. It measures 9 in. by 6 in.

A cast-iron outer frame supports a nickel-steel grid carrying, in turn, three insulated supports. On these rest the zig-zag element which is free to move both ways within limits to allow for expansion. The grid can also be moved by virtue of its support on four pins—two in each end of the frame. There are two sections of the element in parallel, and three-heat control is arranged for on the primary side of the transformer.

In our issue of March 9th we described, under the heading "An Unusual Washer Boiler," a new "Revo" appliance, and referred to it as the "Electrawash." We are informed that this was not the "Electrawash," which is an inexpensive machine introduced a month or two ago, but an entirely new model.

A Double-pole Switchplug

There are many unique features in the design of the new 15-A double-pole two-pin and earth interlocking switch-plug marketed by MESSRS. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Salford, 6. As will be seen in the drawing, the switch is operated by moving the external handle from one side to another. This action turns a bakelite cam which then presses on two long copper strips, forcing them into contact with the plug pins at the top and the switch contacts (which also form the cable terminals) at the bottom, thereby completing the circuit.



A constructional view of the new "Goltone" switchplug, showing how the cam-operated strips make contact with both the cable terminals and plug pins

Simple springs return the strips to the "off" position, and the special construction of the stud-headed plug pins allows the copper strips to grip them firmly when in the "on" position, or, should it be switched "on" while the plug is out, prevents the latter being inserted until the switch is off. Both the springs and the copper strips may be withdrawn easily when the bakelite cover has been removed.

Sparking is reduced to the minimum by the four breaks, and although the switch is rated at 10/15 A, tests with 40-A at 230 V have been sustained for several hours. The list price is 8s. 6d. The base is of vitreous china, and the cover can be supplied in brown, walnut or mahogany finished bakelite.

Thermostat Adjustment by the Consumer

The "Adjustastat," an improvement recently adopted by MESSRS. FERRANTI, LTD., Hollinwood, Lancashire, for their "Thermolator" (thermostatically controlled circulator), allows a limited adjustment of the thermostat by the consumer as follows: For normal domestic hot-water demands during the week the consumer can run the apparatus at a low temperature of about 140 deg. F., so reducing pipe losses and electricity consumption, and, in hard-water districts, considerably helping to reduce scaling. Further, on peak-demand days the thermostat can be altered to permit a higher water temperature and, in consequence, a greater supply of water at a usable temperature. Less frequent operation of the thermostat results, of course, in improved load factor.

Construction and housing of the "Thermolator," showing the flexible element

The "Adjustastat" can be set for any maximum limit desired by the supply authority. The following temperature limits are recommended: 120 deg. F. to 185 deg. F. for soft-water districts, and 120 deg. F. to 170 deg. F. for hard-water districts. Instead of the standard cup on the "Thermolator" housing, there is a new cap which exposes the "Adjustastat" handle. The "Thermolator" is available in 1-, 2- and 3-kW models, and in lengths, without extension pieces, of 16 in. and 30 in. 6-in. and 12-in. extension pieces are available.

A High-amperage Bridge Fuse

THE BRIGHTON LIGHTING & ELECTRICAL ENGINEERING CO., LTD., St. Martin's Place, Lewes Road, Brighton, has introduced an improved design of high-amperage bridge fuse. The principal modification is that the contacts in the base consist of separate copper strips coupled together by copper brushes, thus enabling each blade to be self-aligning on the bridge block, securing, it is claimed, about 95 per cent. surface contact. Pressure is applied to the contact by spiral springs housed in recesses in the porcelains. This design allows a large current-carrying margin.

The spring pressure can be varied, but at the maximum value required the bridge can easily be withdrawn from the contact blocks. The illustration shows a 300-A, 500-V model, for which the new type of contact has been adopted. Four

---

Correspondence (*continued from opposite page*)

radiation and central heating have a depressing effect. With high-efficiency radiant heaters it is not necessary to raise the air temperature to the same degree to establish comfort conditions, and this to some extent reduces the complaint of stuffiness common to many systems of artificial heating.

To obtain ideal "comfort conditions" with electric heating it is essential that the humidity as well as temperature should be controlled, and this applies to any form of artificial heating. Air conditioning is finding favour in many directions both for industrial and domestic use. One of the latest applications of electric air conditioning is in the dining cars on American railways and the success attained is leading to many new applications for cinemas, stores, &c. There are many systems of "air conditioning" in use, but the reversed system of refrigeration with "Freon" gas as refrigerant, gives an all-the-year-round service—giving the desired heat in winter and lower temperatures for summer—the humidity in each case being automatically controlled to give ideal comfort conditions. Hospitals which have installed this system record quicker recuperation of patients and a great reduction in the "common cold" in winter months. ARTHUR IMBERY.

Halifax, *March 12th.*

A Lift-control Problem

The metal rectifier is now definitely established as an efficient method of obtaining direct current for operating contactors for a variety of purposes. This applies particularly to the lift or elevator industry where designers are faced with the problem of providing control gear which will operate with a minimum of noise. When control gear is used to operate passenger-carrying lifts great care has to be taken to prevent, as far as possible, any danger to human life, and in their efforts in this direction designers have paid great attention to the possibilities of earth faults.

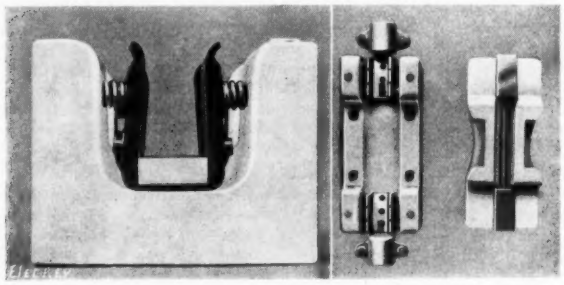
Control gear connected across "outers" is a potential source of danger, owing to the fact that such a fault may short-circuit landing gate locks or safety contacts, and feed control coils with half-voltage. This half-voltage will maintain coils which are already energised, and in some cases will pull in coils which have been liberally rated. A safe solution has been found by feeding the control circuit from one "outer" to neutral on both a.c. and d.c. installations.

Recent investigations, however, have shown that where a metal rectifier is used there is still a possibility of accident, as with the usual bridge formation, and with an earth which occurs in such a position between coils that only one fuse is blown, a.c. can flow through one limb of the rectifier and possibly energise a reversing coil with half-cycle impulses.

This intermittent supply is rarely capable of operating a coil, and at first sight would appear to present no danger whatever, but the association of the supply company's earth on neutral wire and the accidental earth gives a second path through another limb of the rectifier, so that the coil is energised on one half-cycle through one limb of the rectifier, and discharges itself through another limb *via* the two earths, thereby keeping a flux established which may reach 90 per cent. of full magnetisation. J. & E. HALL, LTD.,

Dartford, *March 10th.* V. A. Patterson, *Director.*

rubber pads on the top of the walls of the fuse base prevent the two faces of the porcelain bridge and the base being knocked together when the bridge is inserted. The

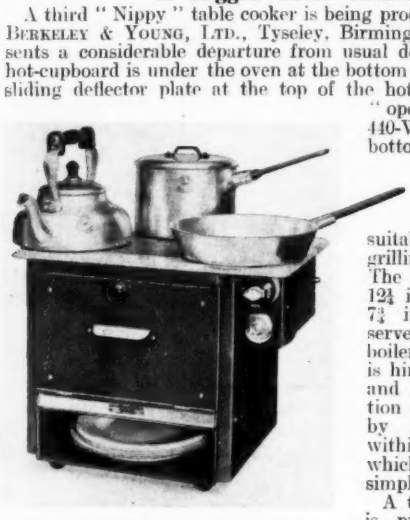


A 300-A, 500-V bridge fuse

principle is being applied also to knife-switch contacts for switchboard mounting and for kiosks and feeder pillars.

A Lagged Table Cooker

A third "Nippy" table cooker is being produced by Messrs. Berkeley & Young, Ltd., Tyseley, Birmingham; this represents a considerable departure from usual design in that the hot-cupboard is under the oven at the bottom of the cooker. A sliding deflector plate at the top of the hot-cupboard, when "open," exposes the 440-W element at the bottom of the oven to the interior of the warming chamber and renders it suitable for light grilling operations. The oven measures 12¾ in. by 10 in., by 7¾ in., and is also served by the 1,800-W boiler-griller. The hob is hinged at one side and is fixed in position at the other side by a single screw within the switch box which also houses the simple wiring.



The "Nippy" No. 3 table cooker

A three-heat switch is provided for the griller-boiler, while a single-heat switch controls the bottom oven element. When the hob plate is used for boiling the top heat in the oven can be regulated by a damper plate, and irrespective of what part of the cooker is being used the hot-cupboard is always available. The oven temperature can be brought up to 400 deg. F. in from five to seven minutes, and sufficient heat for baking can be maintained in the oven with the bottom heat only. Efficient lagging of both the oven and the hot-cupboard affords the advantage of residual heat inherent to larger cookers. The price of "Nippy" No. 3 is to be about £3 5s., including a thermometer. The invention is provisionally protected.

New Tucker Accessories

In addition to the new items mentioned in our special British Industries Fair number, Messrs. J. H. Tucker & Co., Ltd., King's Road, Tyseley, Birmingham, 11, have introduced several new "Telaccessories." These include a two-way angle-entry adaptor in moulded brown "Telacite" for use with two- and three-pin B.S. gauge sockets and switchplugs. The horizontal pattern is only available with two pins. There is also a 15-A "Stelac" teak-cased fuseboard embodying a new construction of case and lid, which has several advantages over the ordinary type. The size has been reduced, although adequate wiring space has been allowed.

New "Telaccessories": The "Stelac" teak-cased fuseboard, and (inset) the 5-A plug with protected cable entry

The hinging of the lid on the case is so arranged that it can be removed readily during installation without manipulation of screws and yet when mounted in position on the batten frame it cannot become detached accidentally. When the necessity arises to inspect the fuses the lid of the case will swing open in the usual way on releasing the hook and pin fastener, and both branch and main terminals are of the front connection type so that the fuse units do not require to be disturbed for wiring.

The new design of 15-A d.p. tumbler switch has the contact arms separated from the mechanism by a piece of porcelain insulation which provides a considerable creepage surface, thus rendering the switch suitable for operation in damp situations.

The general design of the new 5-A two-pin plug with protected cable entry is similar to the existing "Four Entry" pattern, the additional feature consisting of an arch-shaped guard at the point of entry of the flexible cable. This guard is integrally moulded to the disc portion of the plug.

A Resistance-measuring Instrument

A new testing set has been produced by Messrs. Dynameg, Ltd., 41, Oriel Road, Bootle, Liverpool. This instrument is designated the "Duo-Dynameg," and affords the user the choice of two testing pressures, 500 or 1,000 V, both voltages at constant pressure, the voltage selection being effected by the turn of a switch. It has a clear, open scale calibrated from 0 to 100 megohms and infinity.

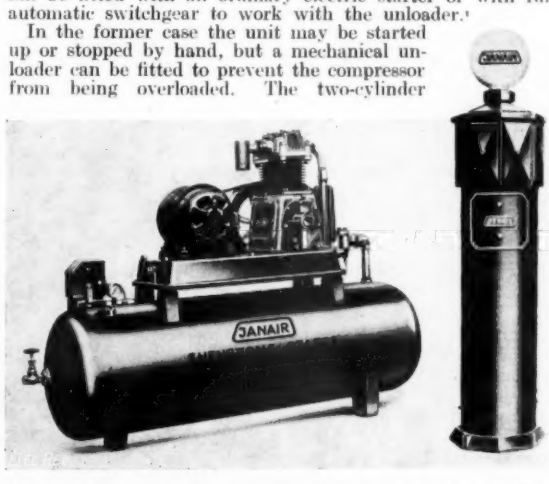
The generator is of special design and fitted with slipping clutch, free-wheel, ball bearings and folding handle. The whole is enclosed in a solid, oil finished, teak case measuring 7¾ in. by 6 in. by 6½ in., and weighs 8¾ lb. The complete measuring instrument can be obtained for £18 18s.

The "Duo-Dynameg"

Self-contained Air Compressors

The compressor and its driving motor of a range of self-contained air compressors complete with receivers produced by Shenstone Engineering Co., Ltd., Janair Works, Shenstone, Staffordshire, are mounted on a common cast-iron bedplate arranged for V-belt drive, and the whole unit is either fitted on the top of a horizontal air receiver or placed on a small foundation with a vertical air receiver. Either combination can be fitted with an ordinary electric starter or with fully automatic switchgear to work with the unloader.

In the former case the unit may be started up or stopped by hand, but a mechanical unloader can be fitted to prevent the compressor from being overloaded. The two-cylinder



An air-compressor and horizontal receiver set, and a "Janair" automatic air tower (motor unit in top)

design is common to all sizes of compressor, and the makers claim that a two-cylinder unit with a swept volume equal to that of a single-cylinder machine gives an increased output of 26 per cent., with the required power reduced by 23 per cent. The aluminium cylinder head also assists cooling.

Single-stage air- and water-cooled compressor units are available in swept volume capacities of from 2 cu. ft. per min. (½-h.p. motor) to 22 cu. ft. per min. (4½-h.p. motor) at pressures of 100-150 lb. per sq. in. (air-cooled) and 125-175 lb. per sq. in. (water cooled), while two-stage air- and water-cooled sets are available in 3½, 6 and 11 cu. ft. per min. capacities (1-, 1½- and 3-h.p. motors) at 150-200 lb. per sq. in. (air-cooled) and 500-700 lb. per sq. in (water-cooled).

In "Janair" air towers the receiver is vertical and forms the base for the air compressor, motor and control gear, the whole being a self-contained unit. Where required an additional air receiver may be fitted in series. The towers are manufactured in four sizes, having capacities of from 5 cu. ft. per min. to 18 cu. ft. per min.

Trolley-bus Control Gear

Equipment recently supplied to the St. Helens Corporation

THE electric control equipment for the new St. Helens four-wheel double-deck trolley-buses has been built by the E.M.B Co., Ltd., West Bromwich, and comprises a master controller, contactor panel, reversing switch, main circuit-breaker and the new E.M.B. light-weight resistance.

The master controller, which weighs only 12 lb., has nine notches, five starting and four field diversion, but thirteen notches are obtainable with this size and any combination of contactors (to give shunted field, plain series, series parallel or regenerative control) can be accommodated. The body is a light alloy casting and the contacts are carbon, working in conjunction with bronze segments.

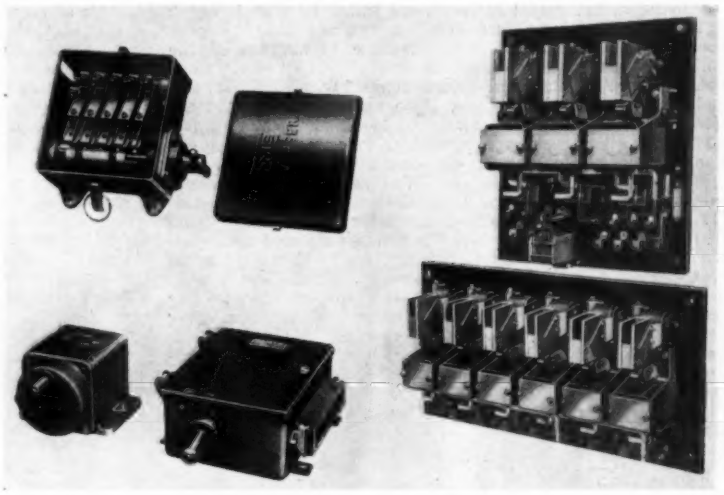
The motion for operating the master controller simulates that of an accelerator pedal, but if a definite speed limit is exceeded the main contactors do not close. A similar provision is made between the full-field and field-diversion notches to ensure the requisite pause while the motor picks up.

The contactor panel is divided into two portions and consists of E.M.B. heavily rated contactors mounted on ebony "Sindanyo" panels. The contactors are made of high-permeability steel pressings, embody powerful magnetic blowouts and are electrically and mechanically interlocked. They are fitted with renewable contact tips of heavy-gauge hard-drawn h.c. copper.

The contacts open and close with a quick positive rolling action, and the arc shields on each contactor are hinged and swing upward to allow of inspection. Condensers are used in the coil circuits. All terminals for wiring up *in situ* are located on the front of the panel.

The body of the reversing switch is a light alloy casting with a lid fitted with quick-releasing catches. The contact fingers are made from pressings. The renewable finger tip is a half-round section of h.d. copper, having a tee-slot across the flat face for receiving the square-head bolt which secures it to the lever pressing. This design prevents the tip studs working loose and permits for easy finger-tip renewals.

The switch is electrically interlocked with the controller equipment so that if it is inadvertently opened while the foot pedal is on a power notch the current is broken on the contactors and not on the reversing switch. A skate switch of similar design, for use over tram tracks, can be supplied.



Top left: Reversing switch. Bottom left: E.M.B. master controller compared with standard type circuit-breaker. Right: Contactor panels

The resistances are carried in front of the chassis over the fore axle beneath the floor of the driver's cab, where ventilation is obtained by louvres in the dash. By special arrangement of the connections, it is possible to use the same banks of resistance for field diversion and starting. The circuit-breaker is of the standard traction type fitted with adjustable overload trips.

Dutch Electrical Imports and Exports

FROM the Dutch trade returns for last year just to hand we have compiled the appended tables showing the imports into and exports from Holland of electrical machinery and allied material during 1933, as compared with the preceding year, from which it will be seen that imports continue to be seriously affected by the general industrial depression, showing a decline of £216,100. On the other hand the value of exports of similar material made an advance of £88,925

IMPORTS.

	1932. Quantity. Tons.	1932. Value. £.	1933. Quantity. Tons.	1933. Value. £.
Electrical machinery and parts	1,345	171,415	3,198	371,750
Telegraph and telephone apparatus, material, and parts	3,097	442,915	2,969	329,585
Radio apparatus and parts...	2,448	677,915	2,277	575,000
Incandescent lamps (number of)	6,722,000	72,500	3,186,400	49,165
Arc lamps	14	2,830	18	1,580
Copper and brass wire and cable, not insulated ...	4,218	142,915	4,366	128,835
Electric vacuum cleaners (number of)	51,924	182,250	76,807	210,250
Wire and cables, insulated ...	11,583	336,000	9,452	254,665
Bulbs for electric lamps ...	125	7,000	99	5,165
Electric locos. and vehicles...	60	6,330	56	6,665
Other electrical apparatus ...	5,975	694,330	5,081	587,580
Total Imports ...	—	£2,736,400	—	£2,520,240

The figures relative to machinery—which are one of the few which indicate an increase—show that Great Britain has displaced Germany as the principal supplying country, being credited with £150,665 as against £84,915 by our competitors; followed by Switzerland, Belgium, and the United States. Telegraph and telephone apparatus and material, however, still come principally from Germany. Germany is credited with £303,750, or over 50 per cent. of the radio apparatus imported, followed by Great Britain, Switzerland and France.

The vacuum cleaner trade in Holland is mainly German; 52,627 German vacuum cleaners were imported as against 13,093 from Sweden, 4,585 from Great Britain, 4,272 from the United States and 1,401 from Italy. Germany again leads in the case of insulated wires and cables, being credited with £197,750, or over 77 per cent. of the total.

Imports of unclassified electrical apparatus are also largely in the hands of German manufacturers to whom £429,500 is attributed as against £86,250 to Switzerland and £21,750 to the United Kingdom, which come next in the list. As regards electric lamps, Holland, owing to the increasing importance of its home production, is steadily decreasing its imports. Last year Germany supplied the largest quantity (1,726,500), the number from Japan declining from 4,130,200 to 599,200, other supplying countries in the order of their importance being Belgium, Czecho-Slovakia, France, Austria, and Finland. Great Britain is not mentioned under this heading. Germany and the United States control the bulk of the trade in non-insulated wires and cables.

EXPORTS.

	1932. Quantity. Tons.	1932. Value. £.	1933. Quantity. Tons.	1933. Value. £.
Electrical machinery and parts	969	97,580	1,045	84,500
Telegraph and telephone apparatus, material, and parts	216	21,080	94	12,165
Radio apparatus and parts...	6,358	3,203,330	6,772	3,301,665
Incandescent lamps (number of)	19,597,200	623,500	23,294,400	709,915
Arc lamps	60	6,080	52	6,080
Electric vacuum cleaners (number of)	3,598	12,750	2,384	7,000
Copper and brass wire, not insulated	704	22,600	999	28,580
Wire and cables, insulated ...	3,608	130,250	5,537	147,915
Bulbs for electric lamps ...	1,448	89,165	1,027	68,750
Electric locos. and vehicles...	103	11,580	2	330
Other electrical apparatus ...	835	217,330	904	157,330
Total Exports ...	—	£4,435,305	—	£4,524,235

Reference to the above table of exports shows an upward tendency, particularly as regards radio material, electric lamps, and insulated wires and cables. The official returns are not so informative on the export side. Germany, Belgium, and the Dutch East Indies are at present the largest buyers of Dutch electrical machinery. The Dutch East Indies, Belgium, and Italy are the best customers for uninsulated copper wire; Austria and Germany purchased the largest quantities of Dutch vacuum cleaners; and Great Britain and Belgium those of electric lamp bulbs.

Parliamentary News (BY OUR SPECIAL REPORTER)

A SELECT Committee of the House of Commons, presided over by Mr. D. D. Reid, gave its approval on March 7th to the South Metropolitan Gas Bill which applies to the promoting company's area the principle laid down last session in the Gas Light & Coke Act and the Commercial Gas Act that a local authority shall not impose any restriction on the form of light, heat or power used in houses on its estates. The Bill was opposed by the Woolwich Borough Council which, while not contesting the principle, submitted that because of special circumstances the Bill should not apply to their Page Housing Estate, which is "all-electric."

Tenants of municipal houses were called to give evidence of their desire to have freedom to use gas, and Mr. G. Evetts, consulting engineer, also gave evidence in support of the Bill. He said that he visited a number of "all-electric" houses. Some people were definitely content with electricity and had no intention of changing. One man said he would not have gas at any price. A few found electricity too expensive, and a very large proportion wished to have electricity for lighting and gas for heating and cooking.

Mr. S. Turner, K.C., for the Woolwich Borough Council, said that in 1920 when the Page Estate was started the Gas Company offered to equip the houses for gas if it were used for all purposes. Then when the Council decided that electricity should be used for lighting, the Gas Company asked that the Council should pay half the cost. Later the company withdrew its offer altogether and even went so far as to take steps to be relieved of any obligation that it might be under to supply gas on the estate. That was why the Page Estate became "all-electric," and, in the circumstances, he submitted that it should be excluded from the operation of the Bill.

The Committee found the preamble proved and the Bill was allowed to proceed without amendment.

The Brighton and Hove Gas Bill

The Committee considered this Bill on March 8th. It contains a similar clause to that inserted in the above-mentioned measures. The Brighton Corporation and the Portslade Urban District Council had petitioned against the Bill and were represented by counsel.

Mr. Tyldesley Jones, K.C., for the promoters, said the company operated in the area of two county councils and ten local authorities, but only two of the latter opposed the Bill. Brighton Corporation, which owned an electricity undertaking, made an arrangement with the Gas Company for the supply of gas on the White Hawk housing estate when house building began, but later changed its policy and had now built over 900 houses which were all-electric. Standing charges and the charge for hire of electrical equipment were collected as part of the rent, and had to be paid whether electricity was used or not. If a tenant wanted a gas cooker the Corporation would not remove the electric cooker. The two cookers were therefore put in a small kitchen, and there was not much room for anything else. There were four tenants who used gas, but he was bound to say that they were employés of the gas company.

Mr. Maurice Fitzgerald, counsel for the Brighton Corporation, said he hoped the Committee would keep an open mind until it had heard his case. The chairman said that the question was whether this case conformed to the decision of the House, after long debate, laying down general policy. Mr. Fitzgerald maintained that the House laid down a principle as regarded the particular case before it. The chairman said he thought that it went further. Counsel would have to take himself out of the general principle if he wanted to succeed.

Consideration of the Bill was continued on Friday last, when the case for the opposition was heard. Mr. Maurice Fitzgerald, for the Brighton Corporation, said that it was quite untrue to suggest that "all-electric" houses were built to bolster up the Corporation's electricity undertaking. That undertaking had never since its inception been a charge on the rates, but on the contrary had contributed £173,000 in relief of rates. The fact that similar Bills had been passed did not mean that all Bills of this kind must be approved. It was often found that administration which worked well in one district was not satisfactory in another.

Mr. Edward Taylor, manager of the Corporation's housing estates, said that at the present time the demand for all-electric houses was greater than that for those fitted with gas and electricity. Mr. J. H. Downs, who lives on one of the Corporation's estates, said he had taken part in a canvass of the tenants of 314 all-electric houses and 305 expressed complete satisfaction.

The Committee found the preamble proved and ordered the Bill to be reported to the House without amendment.

L.N.E.R. Electrification

On March 12th Mr. Thorne asked the Minister of Transport whether he had considered the resolution sent from local authorities in the East End of London urging the provision of an underground railway passing through Bethnal Green, that the electrification of the London and North-Eastern Railway passing through Bethnal Green should be expedited, and that in connection therewith station facilities should be provided in the vicinity of the former Globe Road station; and what reply he had returned.

Lieut.-Col. Headlam, who replied, said that the Minister had received the resolution referred to and had brought it to the notice of the London Passenger Transport Board and the London and North-Eastern Railway Company, upon whom the responsibility for providing any necessary facilities of this kind would rest.

In the Courts

THE hearing was commenced on March 7th in the King's Bench Division before Mr. Justice Avory and a special jury of an action brought by Mr. James Ralston, haulage contractor, Milngavie, Dumbartonshire, and the Pearl Assurance Co., Ltd., to recover from the defendants, the East Retford Corporation, damages for the destruction by fire of a lorry belonging to Mr. Ralston, owing to the alleged negligence of the defendants as the electricity authority for the district.

The defendants denied that they had been guilty of negligence or that they had committed any breach of their statutory obligations. They further said that the damage to the lorry was caused by the negligence of the plaintiff's agents or servants, and they also counterclaimed for the damage done to a pole carrying electric cables by the lorry being driven against and breaking it.

The plaintiffs' case, as outlined by Mr. Malcolm Hilbery, K.C., was that on November 24th, 1931, the lorry was going down Cleveland Hill, Great North Road, East Markham, and through a sudden deflation of a tyre the driver could not keep the lorry on the surface of the road; it ran into a ditch and collided with a pole carrying electric cables, the property of the Corporation, with the result that the pole was broken in half and the cables carrying the electricity fell upon and came into contact with the lorry, causing a fire which destroyed it. The plaintiffs alleged that the defendants had been negligent in allowing a continual flow of current through the cables which had been supported by the pole, although they had warning of its being broken and must have known the danger. The Corporation's officials, it was alleged, knew as early as 6 a.m. that something unusual had happened on that particular circuit, and if they had acted reasonably and had properly discharged their duty, they would not have allowed the current to pass through the circuit until they had ascertained what was wrong. Plaintiffs' agreed loss was £745.

Negligence was alleged against defendants for not having the circuit protected by any adequate and suitable circuit-breaker, fuse or other automatic device adjusted to operate upon an "escape of current dangerous to life or property," or on the formation of a new electric circuit by an escape of current dangerous to life and property; making alive after interruption a circuit having a device to operate or operating upon overload without inquiry and without remedying the defect; not keeping the line dead after it had been rendered dead and until defendants had ascertained that it was safe to switch the current on; and in not providing suitable means for the indication and localising of leakage.

Mr. H. West, A.I.E.E., gave technical evidence in support of the plaintiffs' allegations of negligence.

On March 8th Mr. Allen Murray Coombs, M.I.E.E., gave evidence for the plaintiffs in support of the allegation of negligence by the defendants.

This evidence concluding the plaintiffs' case, Mr. Gilbert Paul opened the case for the Corporation. He said that Mr. Ralston had been already paid by the Assurance Company for his loss under the policy and it was therefore the company which was in fact bringing this action.

Mr. J. Smith, a shift engineer employed by the Corporation, said that the power station was closed down at 10 p.m. to 6.45 next morning. On November 29th, 1931, he woke up at between 6.15 and 6.20 a.m., when he noticed that the pilot light which he had in his bedroom was out, showing that there was some trouble at the power station. He immediately went to the station which was close by and noticed that a switch was open. He put the switch in and rang up Mr. Blower (the manager) and told him that the switch in No. 1 main was open. Mr. Blower asked if there was any indication of anything being wrong and he (witness) replied in the negative. There was no fluctuation but only the ordinary movement of the ammeter. At the time he left the station he had received no telephone message. When he found the circuit-breaker open he did not know or understand that there had been some excessive flow of current.

Mr. Edwin Stott, another engineer in the employ of the Corporation, said that it was the practice if a switch came out to replace it and report the matter to the manager. The first telephone call he received was from a woman at 7.15 a.m. She said there was a lorry on fire and asked if the power could be cut off. Witness said that was impossible as it would mean cutting all Retford out. He reported the matter to the manager, who came to the station. Other telephone calls were received about the matter that morning.

At 7 a.m. the loads on the overhead lines were very light. They had two circuit-breakers at the station, one serving the overhead main. If there was a leakage on the overhead line there would be means of localising the leakage.

Mr. G. Robson, mains foreman, said he went to the scene of the fire and he found that the top part of the pole was laying upon and touching the edge of the roof of the driver's cab of the lorry. The three unbroken conductor wires were attached to the top of the pole and were about 3 ft. above the roof of the cab. The insulators were all perfect and the earth wire was not broken. Mr. F. C. Bowman, assistant linesman, corroborated the evidence of the last witness. He said that it was the front part of the lorry which he found burning.

Mr. C. G. Blower, the engineer and manager of the Corporation's Electricity Department, said he had had a number of years' experience and had had charge of a number of electrical works. He said that if a switch at the power house tripped it would immediately be replaced and the overhead linesmen would be instructed to inspect the line and find out what had happened. In the winter time when winds were expected it was a common thing for a switch to come out and in the summer unusual. It would not be practical every time a switch came out to have the whole line examined before the switch was put in. The reason the switch at the junction did not act was because of the accident.

Mr. E. Morgan, general manager, Sheffield Corporation Electricity Department, gave it as his opinion from the evidence before the Court that it was impossible for the lorry to have been set on fire by contact with the electric wires belonging to the Corporation.

Mr. Morgan said that when the wires broke it would not be possible for them to come into contact with the earth bar. Once the pole had come to rest on the top of the lorry the carrier wire would not then be touching the earth bar or earth wire. It was possible in this case for the lorry to have caught fire owing to some defect in its own electrical system. He had known of a case of a fire occurring from this cause some hours after a vehicle had been put away.

The sag of the wires between the poles would be about 3 ft. when properly supported. It was very unusual for a pole to be broken on the overhead system. Before poles were erected on the highway plans had to be deposited and the sanction of the Electricity Commissioners obtained. When the fire occurred that morning the only circuit-breaker that was open was at the station. It was theoretically impossible for the electrical wires to have caused the fire.

Mr. R. F. Markham, A.M.I.E.E., said that since 1919 he had been in charge of the overhead lines staff of Johnson & Phillips, Ltd. The general practice was to replace a switch immediately it opened. In his experience they got tripping of the switches from various trivial causes and especially from birds on the line. He had not seen this overhead system and could find no explanation of the theory which had been put forward of the Corporation's electrical system having caused the firing of the lorry. The sparks which were said to have been seen over the cab of the lorry could not, in his opinion, have been sparks from the overhead line.

This evidence closed the defendants' case and Mr. Samuels, on behalf of the Corporation, submitted that there was no evidence that the regulations of the Electricity Commissioners had been broken by the defendants and further that the regulations particularly relied on by the plaintiffs as having been broken did not apply to this system, which was an e.h.p. system.

Mr. Hilbery contended that the defendants had broken all the regulations on which the plaintiffs relied and particularly the one which required any leakage which occurred to be immediately attended to. Counsel on behalf of their respective clients then addressed the jury.

In summing up his Lordship said it was not suggested by the defendants that the burning of the lorry was due to any negligence of the part of the driver of the lorry. If the jury came to the conclusion that the lorry was set on fire by any breach of duty by the defendants or their employés or by any breach by the defendants of the regulations then the plaintiffs were entitled to recover the agreed amount. So long as the defendants did not exceed their statutory powers and carried out their duties with care and without negligence they would not be liable for what happened. The fundamental question for them to determine was whether the lorry was set on fire by any contact with the electric wires belonging to the Corporation's system.

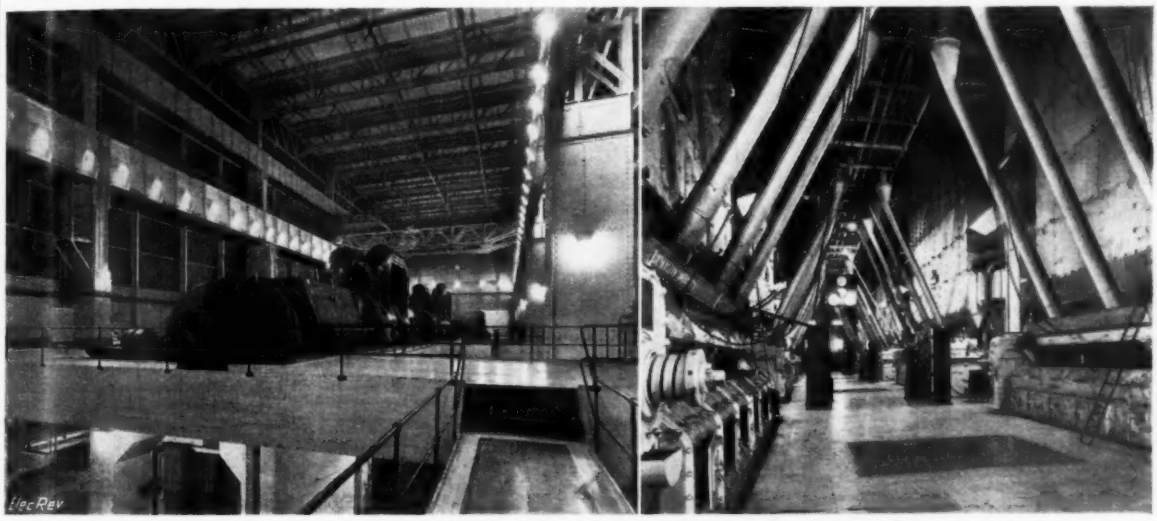
In the result the jury found a verdict for the plaintiffs and judgment was entered for them for £745 with costs, and judgment was entered for the Corporation on the counterclaim for £40 with costs.

A Charge for Fuse Replacement

At Wolverhampton on March 8th Philip Turner, of Wolverhampton, was summoned for arrears of 6s. 9d. in respect of repairs to a Corporation fuse box. At a previous hearing defendant contended that this was a matter for the Corporation and not for him. Mr. G. F. Darlow (assistant town clerk) said that on several occasions during the last three years electrical wiremen had been called to the defendant's house to effect repairs because the Corporation fuses were blown. They found each time that this was due to the fact that the wire on the consumer's fuses was stronger than the wire on the Corporation's fuses. If amateur electricians chose to effect repairs of that kind without realising the risks they ran they must take the consequences. It was not an attempt to pass on a charge which the Corporation ought to bear.

Defendant denied that he had ever interfered with the fuse boxes or used stronger wire as suggested. When it was pointed out he had signed official orders for the repairs to be carried out he said he thought he was merely signing workmen's time sheets.

The Bench ordered the defendant to pay the amount claimed, but refused an application for costs by the Corporation.



The excellence of the lighting in Barking power station can be gauged from these night views of the turbine hall and the firing aisle of the boiler house. **(See note on page 395)**

New Swedish Power Stations

AT Trollhättan, where there is already one of the largest water-power stations in Sweden, a further plant is to be put down capable of developing 100,000 h.p. with two generators. At the present time the Trollhättan station has thirteen sets, which together produce about 140,000 h.p. The existing machinery is to be improved, and when the alterations and the new construction are completed the falls will be harnessed to give a total of 300,000 h.p. The cost of the new work is estimated at 20 million kroner (about £1,000,000). At the present time, when water conditions are normal, over 90 per cent. of the electrical energy used in Sweden is produced from the hydraulic resources of the country, steam power being used only as a reserve for time of water shortage or of exceptionally heavy demand.

The Sillre station of the Waterfalls Board has now been put into service. This station utilises the biggest head of water of any power station in the country and is the first pump storage installation to be set up. The working of the Sillre plant is controlled from the Norrfors station nearly 200 km. distant, Sillre acting as a peak and reserve station for the Norrfors network, being employed, in addition, to pump water for regulation purposes in slack times. The station is designed for three sets, of which two are to be for generators with pumps and the third for a generator alone. At present only one generator with pump is installed.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The Fair Trading Policy

Mr. Felix A. Rogers, the secretary of the Fair Trading Council, has sent us the following note headed "Passing on of Discounts":—

"The attention of the Electrical Fair Trading Council has recently been drawn to instances of architects securing apparatus and fittings for their private clients at trade prices, and of consulting engineers who have obtained a trade discount from manufacturers, in order to supplement their recognised remuneration for drawing up specifications, &c. The Electrical Fair Trading Council desire to remind all members of the industry that neither architects nor consulting engineers are entitled to receive any discount except on behalf of their clients who are recognised trade buyers. Although the Fair Trading Policy is not yet in actual operation, manufacturers, wholesalers and contractors are specially asked by the Council, in the interest not only of themselves but of the industry as a whole, to refrain from allowing discounts where in doing so they would contravene the principles of the policy. When an adequate number of supporters in each class has been obtained the Fair Trading Policy will be put into operation and it is hoped when this is achieved that the misunderstandings and irregular practices that now exist will be gradually eliminated."

Extensions to the Barking Showrooms

The Barking Corporation electricity undertaking has hitherto largely depended upon its power consumers for its load, and of the 9,000,000 kWh sold last year over one-half was purchased by this class of consumer. With the erection

The new electric kitchen at the Barking showrooms

of a large L.C.C. estate and other residential property in the district, however, the domestic side of the undertaking has become of increasing importance, and in anticipation of a greater demand from this source the showrooms, which were opened in 1928, have now been extended at the rear to include an electric kitchen-demonstration room, and further accommodation for the staff, the top floor being a flat for Mr. A. W. Pilgrim, the showroom manager. The most interesting feature of the extension is the demonstration kitchen. This is a large room which will seat fifty people, so that cooking demonstrations can be given to parties, and during the current month the Department has arranged for the various women's organisations in the borough to visit the showroom and witness demonstrations. This room, and the offices above, are warmed by means of tubular heaters supplied by Unity Heating, Ltd., while the lighting is by "Globelite" fittings supplied by Messrs. Falk, Stadelmann & Co., the whole of the installation having been carried out by the Electricity Department under the supervision of Mr. W. E. Kidner, the borough electrical engineer. Messrs. Wm. Warne & Co., Ltd., supplied the rubber flooring, and the inter-house telephones were supplied by Messrs. Siemens Bros. & Co. The building was constructed by Messrs. Myall Bros., to the design of Mr. R. A. Lay, the borough engineer and surveyor. The Department has a hiring scheme for electric cookers, and hire and hire-purchase installation schemes, carrying out the work itself. The charges are moderate.

Birmingham Electric Club Dinner

There was a large attendance at the annual dinner of the Birmingham Electric Club at the Grand Hotel, Birmingham, on March 9th. Mr. J. Parkinson (president) was in the chair. Sir John Pybus, formerly Minister of Transport, in proposing the toast "The City of Birmingham," said that of all the cities in this country, Birmingham had come best through the industrial depression. In electrical development the enterprise of Birmingham was most striking; its electricity undertaking was the largest municipal undertaking of the kind in the country. Mr. F. H. C. Wiltshire, Town Clerk of Birmingham, responded to the toast. "The Birmingham Electric Club" was proposed by the Earl of Dudley, who said that whereas there was an obvious limitation to the functions and development of the gas industry he could see no limitations to the electrical industry. By reason of the very long association of his family with the coal-mining industry he wanted to see coal treated, not as a primary product, to be burned anyhow, but as a valuable raw material to be treated scientifically. They were being squeezed out of the domestic market by gas and electric fires, and were having to break up their fuel that they had been accustomed to sell in small quantities at high prices. It was important that an industry such as the electrical should give the coal industry every assistance in heightening the value of coal by scientific treatment and the extraction of by-products. The President of the Club responded.

The Marking of Imported Radio Valves

Following a recent Board of Trade inquiry an Order has been made prohibiting the sale or exposure for sale unless bearing an indication of origin of (a) thermionic valves dissipating a dead loss at the anode not exceeding 50 W, and (b) rectifying valves not exceeding a capacity of 60 VA or passing a current of more than one ampere. The indication of origin must be marked in a contrasting colour on the bulb or cap of each valve, and also printed or stamped on the carton or other container. The Order (copies of which are obtainable from H.M. Stationery Office, price 1d.) is to come into force on May 26th next.

Registered Electrical Contractors

Applications for registration from the following were accepted by the executive committee of the National Register of Electrical Installation Contractors at its last meeting:—

Halliwell, J. R., Ltd., Manchester.
Electra- Ltd., London, W.1.
Electra (Leeds), Ltd., Leeds.
Birch, T. H., Bookham.
Davies, J. L., Moss Side, Manchester.
Dalton, Wm., & Son, Harpurhey, Manchester.
Lloyd, J. M., Chorlton-cum-Hardy, Manchester.
Whalley, E., Great Harwood.

At the same meeting two applications were withdrawn and eleven were declined.

Works Visit

Sir John Gilmour, Bt., D.S.O., the Home Secretary, accompanied by Viscount Younger of Leckie, D.S.O., Mr. J. Wellwood Johnston, M.P., and Mr. J. Cuthbert, Town Clerk of Alloa, paid a visit to the works of the Harland Engineering Co., Ltd., Alloa, on March 5th. After a tour of the works and a speech of welcome by Mr. C. R. Kemp, director, Sir John addressed about 600 employés and expressed his interest in the work being produced, his admiration of its accuracy and his pleasure at hearing of large orders just received by the firm. The visitors were conducted round the works by Messrs. F. G. Warburton, F. C. Anderson and C. R. Kemp, directors of the company.

Change of Address

The address of the British Chamber of Commerce in Belgium is now 204, rue Royale, Brussels.

Recent Contract

Radiovisor Parent, Ltd., which was recently awarded the contract for the visibility apparatus for the Mersey Tunnel, is now also supplying light-sensitive apparatus for the height gauges and vehicle counters.

A Useful Publication

A new general list published by Alliance Wholesale, Ltd., 62, Great Russell Street, W.C.1, in addition to being a comprehensive catalogue of accessories, materials, switchgear, domestic appliances, &c., is prefaced by a great deal of useful information. There are sectional road maps on a fairly large scale, a list of supply systems, ready reckoners, log tables and notes on regulations and lighting installation design.

Research and the Building Industry

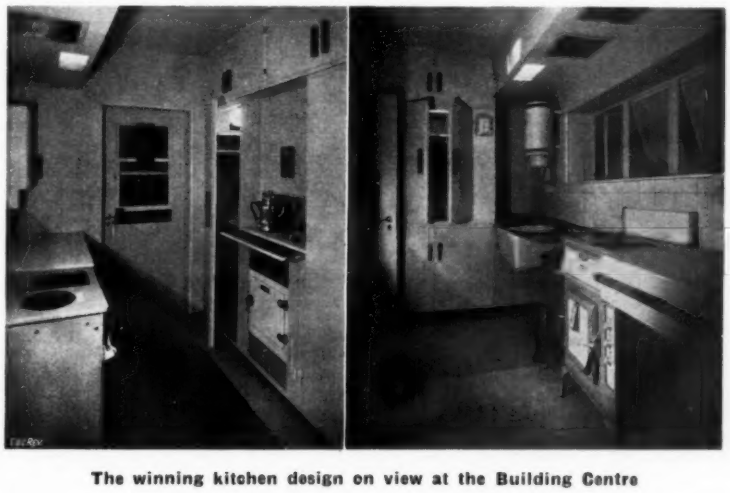
The importance of research and co-operation in the advancement of the building industry was emphasised at a luncheon given on March 7th by the *Financial Times*, and held at the Charlton works of Messrs. Johnson & Phillips, Ltd. Mr. R. J. Barrett, managing editor of the *Financial Times*, presided, and among those present were Mr. G. Leslie Wates, chairman, and Sir Philip Dawson, director of Messrs. Johnson & Phillips, and Sir William Ray, executive chairman of E.D.A. In welcoming the guests, Mr. Barrett said he was especially

glad that they had among them Sir William Ray. The science of engineering had been brought to a level of attainment undreamed of, and in particular the electrical branch, as we knew it to-day, was mainly the achievement of our own generation. Sir William Ray, in proposing the toast of "Architects and the Building Industry," said the ambition of his Association was to see every house in the land equipped electrically, and they recognised that it was largely through the work of the architects, and then through the work of the builders, that that would be brought about. He was sure that architects, interested in beauty and good designs, would find that electricity could play a great part in future developments. Builders could help in the development of electrical uses by remembering the necessity for early wiring in the buildings for which they were responsible. Mr. C. E. Elcock, who responded, said that the development of electricity during the last few years had influenced architecture and building to a tremendous extent, and had given an entirely new thought and new impetus to architectural design.

Sir Philip Dawson described many of the pioneering feats of Johnson & Phillips and their early work in high voltage transmission. Tests were necessary, he said, and research work was essential if progress was to be maintained and if users were to be given security. They had constantly to be carrying on research work because they were a progressive industry. The electrical age had been reached by the co-operation of the manufacturers, architects and builders, and with the continuance of this co-operation we might look forward to securing in this country, in ever greater degree, the most efficient and best buildings. A demonstration which followed the luncheon showed in a comprehensive manner the thorough tests that are carried out to ensure reliability in all types of cables.

The Winning E.D.A. Kitchen Design

In our issue of February 16th we published the names of the prize-winners in the recent electric kitchen design competition organised by the British Electrical Development Association. The winning design by Mr. A. L. Osborne, for houses or flats valued at from £300 to £400, has been carried out at the Building Centre, 158, New Bond Street, W., and will be on view to the public until April 4th. The equipment of this kitchen is adequate, working and storage accommodation good, and practical details well thought out, while the combined lighting and ventilating duct is novel. In their report the assessors state that possible improvements in this design would be chiefly in the direction of increasing the table space for dishing and serving food from the cooker. Two views of the kitchen are shown in the accompanying illustrations.



The winning kitchen design on view at the Building Centre

New Electricity Showrooms

The well-equipped showroom of the Midland Electric Corporation for Power Distribution, Ltd., in the Wednesbury Market Place, was opened by the Mayor of Wednesbury (Councillor P. Griffiths) on March 5th. Members of the Council and officials, Mr. C. R. J. Parkinson, M.I.E.E. (chief engineer of the Corporation), and Mr. C. Heathcock (secretary) attended. The Mayor said that the Corporation sold its electricity undertaking to the company in 1918, and was fortunate in being able to make the arrangements without losing anything. During the past two years there had been negotiations between the Corporation and the company for the right of supplying electricity in the borough, and it had been finally arranged to extend the period till 1973. Special concessions for consumers had been obtained.

The Workington Corporation Electricity Committee has approved plans by the borough engineer for new showrooms in Oxford Street at an estimated cost of £5,000, and it is to obtain tenders for the work.

Improvements which should considerably add to their efficiency have just been completed at the showrooms of the Shropshire, Worcestershire and Staffordshire Electric Supply Co., at Widemarsh Street, Hereford. The showrooms have been extended to include a complete demonstration kitchen. This is artistically decorated, and equipped with the necessary apparatus. Fortnightly demonstrations are to be arranged.

For Sale

Eastbourne Electricity Department has for sale one John Thompson water-tube boiler, with Underfeed chain grate stoker.

Messrs. Andrew & Ashwell will sell by auction on March 20th at Leicester the machinery, plant and stock of Rectifiers, Ltd.

Hull Corporation Electricity Department has for sale one 5,000-kW turbo-alternator and auxiliary plant.

(See our classified advertisements.)

The Vitreous Enamel Industry

A meeting of representatives of various concerns engaged in or connected with the vitreous porcelain enamelling trade was held recently at Birmingham in order to consider the desirability of forming an organisation for this section of the metal industry. After lengthy discussion a Committee was appointed to draft a constitution for the proposed Society. This committee includes Mr. W. H. Whittle, of the Protect Lamp and Lighting Co., Ltd. (chairman), and Mr. J. H. Coupe (Messrs. Belling & Co.).

Trade Announcements

Messrs. Rashleigh Phipps & Co., Ltd., are removing to-morrow (Saturday) to 2, Hanover Square, W.1 (telephone: Mayfair 6632-5).

The Colton Electrical Equipment Co., 12, Hamilton Road, Highbury, N., has acquired the entire business interests, stock, plant, &c., of the Albert and J. M. Anderson Manufacturing Co.

A New Belgian Association

The Groupement des Electriciens de Belgique is the name of a new association which has been formed in Brussels, with temporary headquarters at 19, Avenue Reine Marie Henriette, Forest, to protect the interests of retailers of electrical fittings and supplies and of installation electricians throughout Belgium.

Indexed List of British Standard Specifications

The British Standards Institution has issued its half-yearly handbook and indexed list of British Standard Specifications. The section devoted to current lists of British Standard Specifications includes a numerical list, the new Specifications in course of preparation, and a complete subject index, which will be found useful in drawing offices and purchasing departments of public authorities and firms throughout the building, chemical, engineering and allied industries. Copies of this publication (Reference CD 2000) are available from the Institution's Publications Department, 28, Victoria Street, S.W.1, price 1s. 2d. post free.

An Inquiry at Bridgend

At the request of the Bridgend (Glamorgan) Council an independent investigation into the administration of the Electricity Department has been conducted by Major E. Ivor David and Professor G. Knox. In their report, which has just been issued, Major David and Professor Knox state that many of the complaints were unjustified. With regard to complaints concerning service charges, however, no satisfactory explanation had been forthcoming in some cases, and steps should be taken to remedy existing defects and retain the confidence of consumers or attract new consumers. The Council should also seriously consider the advisability of reverting to the original method of including service charges in the "unit" cost in place of the present system of making separate charges to individual consumers for supply services. The report suggests that a reorganisation scheme should be carried out, including the provision in the centre of the town of a showroom, accounts office, and information bureau, and the appointment of properly qualified assistants to whom the electrical engineer could assign responsibility. The commissioners further recommend that the Council should accept the South Wales Power Co.'s offer to give a supplementary supply up to 750 kW or more, the Council to run the generating plant as a peak-load station during the day only. The report concludes with the statement that, except for a number of small complaints which would be obviated by an improved organisation, the commissioners found no evidence whatever to substantiate rumours against the honesty and integrity of the staff.

Australian Electrical Imports

The imports of electrical machinery and appliances into Australia improved as a whole during the last half of 1933. Their total value was then £751,172, as compared with £731,500 during the six months ended December, 1932. The values of the principal groups were as follows, comparative figures being in parentheses:—Batteries and accumulators, £7,416 (£11,818); covered cable and wire, £210,797 (£197,718); dynamo electric machines, £130,381 (£59,680); filament lamps, £60,354 (£52,626); telegraph and telephone apparatus, £34,717

(£18,937); and other electrical machinery and appliances, £307,507 (£390,766).

The South London Exhibition

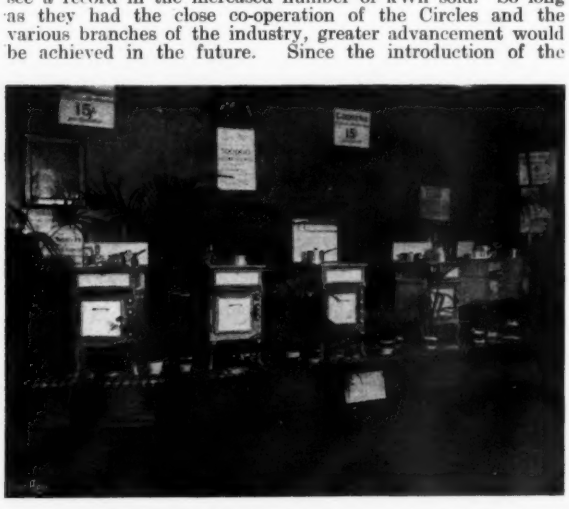
The South Metropolitan Electric Light & Power Co., Ltd., the South London Electric Supply Corporation, Ltd., and the County of London Electric Supply Co., Ltd., have an attractive stand at the South London Exhibition at the Crystal Palace, which was opened by the Prime Minister on March 7th and closes to-morrow (Saturday). A special demonstration theatre has been erected upon the stand where demonstrations of cooking, washing, hair-drying and electrical cinematograph films are shown. A large number of leading apparatus manufacturers have co-operated in providing the stand with their appliances, and the result is undoubtedly a very fine display.

E.D.A. Luncheons

Sir William Ray was the principal guest at a luncheon held at the King's Head Hotel, Newport, on March 12th, under the auspices of the South Wales and Monmouthshire Area of E.D.A., with Mr. A. Nichols Moore, borough electrical engineer, Newport, and chairman of the Area Committee, in the chair. The toast of "The Association and the Area Committee" was proposed by Sir Robert Webber, who referred to the increasing importance of the electrical industry and said that all great industries should have development associations. Responding, Sir Wm. Ray said that he saw nothing to prevent the electrical industry from becoming one of the foremost industries in the land. From any and every point of view—industrial, agricultural, domestic—the development of the industry was inevitable. What they had to do, however, was to hasten that inevitability, and he would therefore urge that South Wales and Monmouthshire should do all in their power to further the activities of the Association. Other speakers were the chairman, Mr. G. Douglas Coe (deputy-chairman of the Area Committee), Aldmn. F. W. Raikes, J.P. (chairman of the Newport Electricity and Tramways Committee), and Mr. Arthur Ellis.

The annual luncheon of the South Western Area of E.D.A. was held at the Royal Hotel, Bristol, on March 13th, when Mr. A. J. Newman (chief engineer and general manager, Bristol Corporation Electricity Department and chairman of the South Western Area) presided over a large gathering. Mr. N. K. Lindsay, M.P., proposed the toast of "The British Electrical Development Association and the South West Area" and commented upon the great progress that electricity had made since the passing of the 1926 Act.

Sir William Ray, M.P., responding to the toast, said there was an enormous amount of development work to look forward to, and he pleaded for a 100 per cent. membership in the area in order to present a united front. Having the confidence of the areas he could go forward with his task with a perfectly clear mind. Mr. A. J. Newman also responded to the toast and said he thought that Bristol's progress was typical of the area. He forecast that the present financial year would see a record in the increased number of kWh sold. So long as they had the close co-operation of the Circles and the various branches of the industry, greater advancement would be achieved in the future. Since the introduction of the Bristol two-part domestic tariff a year ago, approximately 2,000 cookers had been installed, and at present they were connecting cookers at the rate of fifty per week and water heaters at the rate of 100 per week. Bristol hoped to further reduce its fixed domestic charge.



An electric cooker display arranged by Gravesend Electricity Department at the recent local exhibition

Sir William Ray presented the first and second prizes obtained in the Public Speaking Competition to Mr. R. V. Bray (Bristol Electricity Dept.) and Mr. C. G. Agg (West Gloucester Power Co.). The "Guests and Visitors" was proposed by Mr. F. H. Corson (city electrical engineer, Gloucester) and Mr. J. W. Beauchamp (general manager, South West England and South Wales Area, C.E.B.) responded.

New Catalogues and Lists

Humane Stunner Co., 73, Southampton Row, W.C.1.—Details of the company's animal stunner.

A display by three London electricity supply companies at the Crystal Palace

Westminster Tool and Electric Co., Ltd., Westool Wor... Putney Bridge Road, S.W.15.—A leaflet on the "Westool ... drill.

W. T. Glover & Co., Ltd., Trafford Park, Manchester, 17. ... 72-page catalogue giving details of "Diatrine" paper-insulat... lead-covered and armoured cables.

Hotpoint Electric Appliance Co., Ltd., 24, Newman Stree... Oxford Street, W.1.—A leaflet describing the new No. ... "Duplex" vacuum cleaner.

British Home & Office Telephone Co., Ltd., 272, Vauxha... Bridge Road, S.W.1.—A leaflet describing the company's fre... installation scheme.

Ruston & Hornsby, Ltd., Lincoln.—A booklet describing Li... coln and the company's products.

Gent & Co., Ltd., Faraday Works, Leicester.—The "Tange... Bulletin," describing the company's latest productions.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2 ... A "Home Series" lighting fittings catalogue.

Geo. Thomas & Co., Ltd., Parsonage Lane, Deansgate, M... chester, 3.—A catalogue of eddy current tachometers.

Hopkinsons, Ltd., Huddersfield.—Particulars of the "Ho... kinson-Moynan" steam purifier.

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.4. ... Leaflets on eddy-motor-driven reversing or alternate actio... timers and self-acting two-speed controllers for squirrel-ca... pole-changing motors.

Dynameg, Ltd., 41, Oriel Road, Bootle.—Particulars of t... "Duo-Dynameg."

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Leaflet on flam... proof plugs and sockets for use in mines.

L. G. Hawkins & Co., Ltd., Drury Lane, W.C.2.—Particula... of the "Supreme-de-Luxe" vacuum cleaner.

G.W.B. Electric Furnaces, Ltd., Elecfurn Works, North Roa... Holloway, N.7.—A leaflet dealing with "Shell-Wild-Barfield ... quenching oils.

British Insulated Cables, Ltd., Prescot, Lancs.—Catalogue ... power, wireless and telephone condensers, and a leaflet ... "Bi-durite" insulated wires and cables.

Greenwood & Batley, Ltd., Albion Works, Leeds.—A brochu... on "Greenbat" mining motors.

S. Wolf & Co., Ltd., 115, Southwark Street, S.E.1.—Lists ... bench grinders, electric blowers, and flexible shaft filin... machines.

R. F. Winder, Ltd., Belgrave Electrical Works, Leeds.— ... register of new and secondhand electrical material.

Company Liquidations

K. G. Clark, Ltd., wireless dealers, &c., 17, Electric Parad... South Woodford, and formerly at Ilford.—The statutory fir... meetings of creditors and shareholders under the compulso... liquidation of this company were held on March 9th at Car... Street, W.C., before Mr. H. P. Naunton, Assistant Official R... ceiver. A statement of affairs was submitted showing liabi... ties of £2,475, assets of £1,191, and a deficiency of £2,616, wi... regard to contributories, the issued capital amounting to £1,3... The failure is attributed to a misunderstanding that the co... pany was to be granted extended credit in respect of the pu... chase of a large consignment of goods for which it had ... sufficient resources to pay. The liquidation was left in t... hands of the Official Receiver.

Brown & Oliver (Wireless), Ltd., Park Street, Luton.—T... statutory meeting of the creditors herein was held recently ... Luton, when it was reported that the company had gone in... voluntary liquidation with Mr. W. H. French, 21, Cardiff Roa... Luton, and Mr. P. S. Booth, Kimberley House, Holborn V... duct, London, E.C., as joint liquidators. The statement ... affairs showed ranking liabilities of £820 and assets of £1,0... It was decided to confirm the voluntary liquidation of the co... pany, with the liquidators already appointed. A committ... was also nominated.

F.A. Wireless Co., Ltd.—Meetings, April 9th, at Balfour House, Finsbury Pavement, E.C., to receive an account of the winding-up by the liquidator, Mr. W. A. J. Osborne.

Nelson Electric Lamp Co., Ltd.—Winding up voluntarily. Liquidator, Mr. W. J. Funnell, 180, Fleet Street, E.C.4.

Eastern Electric Installation Co., Ltd.—Meetings April 16th at Balfour House, Finsbury Pavement, E.C., to receive an account of the winding-up by the liquidator Mr. W. A. J. Osborne.

Bankruptcy Proceedings

E. G. van der Veen, trading as County Radio Service, 133, Shaftesbury Street, Newport, wireless dealer.—The public examination herein was held on March 6th at the Town Hall, Newport, Mon, when a deficiency of £327 was disclosed. Debtor said he had no commencing capital and ceased trading after eighteen months. He attributed his position to lack of capital and law costs. The examination was closed.

T. F. Jarrett (T. F. Jarrett & Co.), electrical engineer, 14, Springcopse Road, and 63, High Street, Reigate.—Receiving order made March 2nd on debtor's own petition.

H. G. Lawson (E. Cooper), radio and electrical dealer, 1,002, Stratford Road, Hall Green, Birmingham.—First meeting March 16th at 159, Great Charles Street, Birmingham. Public examination April 11th at the Court House, Corporation Street, Birmingham.

J. H. Dinham and **J. H. Meredith** (Electra Contracting Co.), electrical contractors, 50, New Zealand Road, Cardiff.—Trustee, Mr. L. S. Findlay, 35, Windsor Place, Cardiff, appointed March 7th.

E. A. Blest, radio dealer, 71a, Halesowen Road, Old Hill, Staffs.—Trustee, Mr. A. M. Fairbairn, 1, Priory Street, Dudley. Official Receiver, released February 13th.

G. M. Jacob, wireless dealer, 29, Dimond Street, Pembroke Dock.—Trustee, Mr. H. W. Thomas, 4, Queen Street, Carmarthen, Official Receiver, released February 13th.

F. B. Jewkes (Jewkes Radio & Battery Service), radio dealer, 5, High Street, Wordsley.—Trustee, Mr. A. M. Fairbairn, 1, Priory Street, Dudley, Official Receiver, released February 13th.

J. E. Ridgway, electrical and radio engineer, Hightown, Congleton, and 32, High Street, Biddulph.—Last day for receiving proofs for dividend March 26th. Trustee, Mr. P. M. Milward, 12, Lonsdale Street, Stoke-on-Trent, Official Receiver.

Price of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price, March 14th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... „	£38	—
a Borax ... ... „	£17	—
d Copper, Sulphate ... ... „	£19 15s.	—
a Potash Chlorate ... ... per lb.	3½d. to 4½d.	—
a „ Perchlorate ... ... „	6d.	—
a Shellac T.N. ... ... per cwt.	£4 18s.	—
a Sulphur Commercial ... ... per ton	£11	—
a „ Roll ... ... „	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
„ Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b „ Wire ... ... per lb.	1/1 to 1/9	—
b „ Sheet and Foil ... ... „	1/2 to 2/9	—
p Babbits Metal and Anti-friction Metals.—		
Grade I ... ... per ton net	£210	£7 inc.
Grade II ... ... „	£144	£4 inc.
Grade III ... ... „	£70	£2 inc.
c Brass (rolled metal 2" to 12" basis) per lb.	7d.	—
c „ Tubes (solid drawn) ... ... „	9d. to 9½d.	—
c „ Wire, basis ... ... „	7½d.	—
c Copper Tubes (solid drawn) ... „	10d.	—
g „ Bars (best selected) ... per ton	£62	—
d „ Sheet ... ... „		—
g „ Rod ... ... „		—
d „ (Electrolytic) Bars ... ... „	£36 10s.	10s. inc.
g „ „ Sheets ... „	£36 to £36 10s.	10s. to 20s. inc.
d „ „ Wire Rods ... „	£42 5s.	10s. inc.
d „ „ H.C. Wire ... per lb.	7¼d.	¼d. inc.
f Ebonite Rod ... ... „	1/3 to 1/6	—
f „ Sheet ... ... „	1/3 to 1/6	—
n German Silver Wire ... ... „	2/5	—
h Gutta-percha, fine ... ... „	nom.	—
h India-rubber, Para fine ... ... „	5d.	¼d inc.
i Iron, Pig (Cleveland No. 3) ... per ton	62/6	—
i „ Wire galv. No. 1, P.O. qual.... „	£20	—
g Lead, English Pig ... ... „	£13	—
g Mercury ... ... per bot.	£10 10s. to £10 15s.	£1 inc.
c Mica (in original cases) small ... per lb.	6d. to 3/6	—
e „ „ medium ... „	4/- to 8/-	—
e „ „ large ... „	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... „	1/1	—
p „ „ drawn bars & rods „	11d.	—
p „ „ rolled strip & sheet „	11d.	—
p „ „ wire ... ... „	11½d.	—
o Platinum ... ... per oz.	£7 15s.	—
d Silicium Bronze Wire ... ... per lb.	8¼d.	—
r Steel, magnet, in bars ... ... „	7½d.	—
n Tin, Block (English) ... ... per ton	£236 10 to £238 10	£10 inc.
g „ Wire, Nos. 1 to 16 ... ... per lb.	3/8	3d. inc.

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. R. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead and rubber, up to the time of going to press, are given in our "Business Notes" under the same heading.

Electricity Supply

Lighting, Domestic, Power

Altcar (Lancs).—RIVAL SUPPLIES.—The Electricity Commissioners are to decide whether the Liverpool Corporation or the Lancashire Electric Power Co. is to supply Altcar. Under a Fringe Order the Corporation is already supplying certain premises in the parish, and it is now proposed to extend the supply to an estate of about 300 houses and shops at a cost of £4,700, or, alternatively, supply the whole area, the cost of this being estimated at £7,440.

Aspull (Lancs).—OBJECTION OVERRULED.—The Minister of Transport has consented to the Lancashire Electric Power Company placing overhead lines for the transmission of electricity to Aspull. The Minister has overruled objections by the Aspull District Council and the Lancashire County Council.

Audlem.—SUPPLY INAUGURATED.—A supply of electricity, provided by the North Wales & District Electricity Distribution Co., at a cost of about £8,000, was recently inaugurated by Mr. Cartwright, chairman of the Nantwich Rural District Council.

Berwickshire.—MAINS EXTENSIONS.—The Scottish Southern Electric Supply Co., Ltd., has applied to the County Council for permission to construct h.p. and l.p. lines in the county, and particularly in the boroughs of Eyemouth, Duns and Coldstream.

Binbrook (Lincs).—SUPPLY PROPOSAL.—At a recent meeting of the ratepayers officials of the Grimsby municipal electricity undertaking outlined a scheme for extending the supply from Grimsby to Binbrook. It is hoped to have the supply ready by next winter.

Bognor Regis.—REDUCED CHARGES.—The Electricity Co. is to reduce the charges, as from the end of March, for Bognor, Felpham, Aldwick, North Bersted, Middleton and Shripney to 6d. per kWh.

Barking.—LOAN.—The Town Council has applied for a loan of £15,015 for public lighting mains, distributors, feeders, and sub-station equipment for Manor Farm Estate.

Bradford.—NEW EQUIPMENT.—The Electricity Committee has approved a scheme for the provision of additional traction equipment necessitated by the substitution of trolley vehicles for tramcars at an estimated cost, including land and the erection of a sub-station, of £16,454. The Committee has also approved a scheme for the replacement of obsolete switchgear and traction equipment at Odsal sub-station at an estimated cost, including the erection of a switch house, of £16,645. The Committee is also to carry out certain modifications at the Valley Road power station, to meet the requirements of the Central Electricity Board, at an estimated cost of £18,000, which cost, or the capital charge thereon, will be borne by the Board.

Brecon.—BULK SUPPLY.—The Town Council unanimously decided, at a recent special meeting, to enter into negotiations with the Shropshire, Worcester and Staffordshire Electric Supply Co. with a view to obtaining a partial bulk supply next winter.

Cannock.—FRINGE ORDER.—The Electricity Committee is seeking a Fringe Order to supply premises in the parish of Penkridge.

Cardiff.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to borrow £10,000 for sub-stations and equipment and £50,000 for mains and services.

SUB-STATION.—The Electricity Committee is to obtain tenders for the erection of two sub-stations in Earls Court Road and Park Lane.

Clydebank.—ELECTRICITY AT ROTHESAY DOCK.—Consideration has been given to the proposed supply of electricity to Rothesay Dock, Clydebank, by the Clyde Valley Electric Power Co. for the working of the dock equipment and for lighting. Electricity is at present generated by steam engines in the Clyde Navigation Trustees' power station at the dock. In view of the capital expenditure the Trustees would incur in replacing the steam engines, it was stated that there would be a considerable annual saving by obtaining a supply from the Clyde Valley Co. It is recommended that, subject to tenders for the provision of new plant comparing favourably with the former tenders, the Trustees shall enter into an agreement with the Clyde Valley Co. for a period of fifteen years, with provision for two years' notice of termination on either side, a mutual right of investigation of the charges every three years with a view to their adjustment if necessary, and provision for the settlement of differences on the question of charges by an arbitrator mutually agreed upon, or, failing agreement, to be appointed by the Electrictiy Commissioners.

Croydon.—EXTENSIONS TO PLANT.—The Electricity Committee is to proceed immediately with the extension of the steam-raising plant at the power station at an estimated cost of £53,600. The whole of the expenditure will be borne by the Central Board.

Deal.—REDUCED CHARGES.—The South-East Kent Electric Power Co., Ltd., has reduced the charge for lighting from

8d. to 6d. per kWh, and the "unit" charge under the two-part tariff from 1½d. to 1d., as from January 1st.

Dudley.—SUB-STATION.—The Shropshire, Worcestershire & Staffordshire Electric Power Co. is to erect a sub-station on the Priory Estate.

East Ham.—STREET LIGHTING.—The Works Committee is to modernise street lighting in High Street at a cost of £1,380.

Eccles.—SUPPLY TO ESTATE.—The Housing Committee has considered a scheme prepared by the borough electrical engineer for providing a standard supply of electricity to the 725 houses on the Westwood Park Estate. The scheme, so far as the Committee is concerned, involves expenditure estimated at £971 with a further amount for the alteration of the existing wiring of the houses which is said to be only sufficient to carry the lighting load and small apparatus. The borough treasurer stated that under the present system the Committee

The main Liverpool Road at Irlam, illuminated by Wallace lanterns, made by the Wardle Engineering Co., Ltd., with Holophane bowl refractors. Approximately 200 lanterns are employed

realised an annual surplus of approximately £220, and that if the proposed scheme were adopted there would be a deficiency of £415. The Electricity Committee recommended that a plebiscite should be taken of the tenants on the estate in order to ascertain the extent of any additional supply which would be required for purposes other than lighting.

Gravesend.—SUB-STATION.—The Electricity Committee is to provide a sub-station in Love Lane at a cost of £350.

Hastings.—SUB-STATIONS.—The Electricity Committee is to provide and equip two sub-stations in the new Promenade shelter at a cost of £1,880.

Hawick.—POPULARISING ELECTRICITY.—The Urban Electric Supply Co., Ltd., is making an offer to prospective consumers to install three complete lighting points and one plug point free of cost.

India.—MALAKAND SCHEME APPROVED.—It is understood that the Standing Committee of the North-West Frontier Province has approved the Malakand hydro-electric scheme which is to cost about £320,000. It is estimated that the scheme will pay its expenses in about the third year of operation and that it will make a profit in the seventh year. It will supply cheap lighting and power to the rural population in the Peshawar District, and the North-Western Railway and other industrial concerns are expected to take supplies from Malakand. The scheme will be financed by a loan guaranteed by the Government of India.

Irish Free State.—SUPPLY TO MACROOM.—The Electricity Supply Board is arranging to supply electricity to Macroom.

Leyton.—LOAN.—The Town Council is to apply for a loan of £5,000 for the purchase of electric cookers for hiring out.

Lincoln.—LOANS.—The City Council is seeking sanction to borrow £27,000 for mains and services, meters, &c. Sanction has been received from the Electricity Commissioners to a loan of £100,000, as and when required, for new electricity sub-station equipment, mains, services and apparatus in connection with the development and extension of the undertaking.

Luton.—SUPPLY EXTENSION.—The Town Council has applied for a loan of £4,698 for giving a supply of electricity to the new works of the AC-Sphinx Sparking Plug Co., Ltd., and to Toddington Manor, and application has been made to the Ministry of Transport for consent to erect overhead lines for the scheme.

Maidstone.—MAINS IMPROVEMENTS.—The Town Council has applied for a loan of £5,825 for work and apparatus in St. Peter's Street. Electricity mains are to be relaid in a number of thoroughfares at an estimated cost of £3,000.

Oxford.—SUPPLY TO PUMPING STATION.—The Electricity Committee has agreed to supply electricity to the Waterworks Committee for running the pumps at Headington Pumping Station at 0.6d. per kWh provided the plant is not run during peak-load periods.

Redruth.—REDUCED CHARGES.—The Electricity Co. has reduced the charge for lighting from 10d. to 8d. per kWh, with a proportionate reduction to consumers using electricity at contract prices.

Reigate.—MAINS EXTENSIONS.—The Town Council has decided to fix a guarantee revenue of 20 per cent. per annum for five years on the capital cost of mains extensions to developers of estates and others, and subject to this guarantee the mains are to be extended to supply ninety-six houses which are to be built on the Redstone Hill Estate, at an estimated cost of £510. A minimum charge is to be fixed for consumers on the flat rate.

Rotherham.—COOLING TOWER IMPROVEMENTS.—The Electricity Committee recommends the improvement of the cooling tower screening and culvert arrangements at a cost of £4,400.

REVISED TARIFF.—The Electricity Committee recommends the revision of the existing tariff of £4 8s. per kVA of demand, plus 0.275d. per kWh, to £4 per kVA, plus 0.25d. per kWh, in the case of any consumer who is prepared to guarantee a minimum payment of £2,000 per annum.

Scarborough.—SUPPLY TO NEWLANDS ESTATE.—The Electricity Committee is in negotiation with the Filey Urban District Council regarding a proposed supply to the Newlands Estate.

South Africa.—NEW POWER STATION.—In order to meet the demands of the Far West Rand developments and supplement the Central and East Rand supply, a new power station with a capacity of 106,000 kW is to be erected at Vereeniging at a cost of £1,000,000. Later, the capacity of the station may be extended to 350,000 kW at an additional cost of £750,000. It is regarded as an indication that the Government is contemplating the electrification of the suburban railway system of the Witwatersrand, says *The Times*. The Electricity Supply Commission and the Victoria Falls Power Co. are co-operating in the enterprise.

KLERKSDORP SCHEME COMPLETED.—The new municipal power station at Klerksdorp has now been completed. It is of 500-kW capacity, and the plant is of the latest design. It has been decided to make a service charge of 3s. 3d. per room, plus 1d. per kWh.

Southampton.—REDUCED CHARGES.—The following reductions in charges have been made: Lighting (within the borough) from 3½d. to 3d. per kWh; heating and cooking (within the borough) from 1d. to ¾d. per kWh, and without the borough from 1¼d. to 1d.; the alternative residential tariff, now to be called the alternative "all-in" domestic tariff—the running charge to be reduced from ¾d. to ½d. per kWh within the borough and from 1d. to ¾d. outside, and a reduction in standing charge is to be made. It is also proposed to make reductions in the alternative business tariff, the power tariff, the traction tariff, and in the adjustment for variation in the cost of coal for h.p. and e.h.p. supplies.

South Shields.—LOAN.—The Town Council is to make an application for sanction to borrow £3,000 in connection with its assisted-wiring scheme.

Stockport.—FLAT RATE.—The Town Council has adopted a uniform rate by reducing the "unit" charges of 6d. and 4¾d. to 4½d.

Stroud.—EXTENSIONS.—The Rural District Council has consented to the West Gloucestershire Power Co. erecting an overhead line at Blackness and an underground main in Bath Road, Rodborough. The Council has also decided to raise no objection to the Stroud Electric Supply Co. supplying Council houses at Pagan Hill.

Sutton Coldfield.—SUPPLY EXTENSION.—The Electricity Committee has decided to make an extension of the supply to the new housing estates at Boldmere, the estimated cost being £6,031. Application is to be made to the Electricity Commissioners for sanction to the necessary loan.

Tonbridge.—REVISION IN CHARGES.—The Urban District Council has decided that the charges for electricity to consumers in the extended area, to be incorporated into the district on April 1st, shall be the same as those in the urban district. There will also be a charge of 3d. per kWh for shop-window lighting.

EXTENSIONS.—Mains extensions are to be carried out at Hildenborough at an estimated cost of £479.

Wakefield.—LOAN.—The Electricity Committee is seeking sanction to borrow £5,000 for hire-purchase wiring.

Wolverhampton.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £1,770.

IMPROVED LIGHTING.—The Electricity Committee is to provide improved lighting and new lamp standards at a cost of £10,856.

Worthing.—LOAN.—The Electricity Committee has obtained sanction to borrow £8,739 for mains and £1,539 for plant in connection with the supply to Nepcote, Sompting and Salvington.

MAINS EXTENSIONS.—The Committee is to extend mains and provide sub-stations at a cost of £10,221.

Traction

Aberdeen.—TRACK RENEWAL.—At a cost of £17,000 part of the tram track is to be repaired and renewed.

Australia.—BENDIGO AND BALLARAT TRAMWAYS.—The Bendigo City Council has accepted the offer of the State Government for reconditioning the tramway tracks at an estimated cost of £68,000. For reconditioning the tramway tracks at Ballarat and Bendigo £170,000 is required, of which £100,000 is to be provided by the Unemployment Council, £50,000 by the Victoria Government, and £20,000 by the State Electricity Commission.

Glasgow.—ELECTRIC TRACTION WANTED.—The demand for smokeless trains in the city and within a certain radius of the city boundaries is being renewed and the Corporation Health Committee, in its evidence before the Government Committee on Scottish Health Services, will ask that railway companies be compelled to adopt electric traction. Clauses for similar powers were inserted in a draft Provisional Order some years ago, but were withdrawn.

Irish Free State.—THE DRUMM TRAIN.—At the general meeting of the Great Southern Railways Co., in Dublin, the chairman, Sir Walter R. Nugent, said that the Drumm battery trains continued to give satisfactory service, and the company was contemplating the extension of this form of railway operation, if the necessary financial accommodation could be provided.

Italy.—RAILWAY ELECTRIFICATION.—According to *L'Elettricista*, about 37½ miles of single track and 180 miles of double track of the Italian State railways are to be electrified during the current year. The Naples-Gragnano section will be operated by d.c. at 3,000 V, but on the five other sections, three-phase 16-cycle a.c. at 3,400 V will be employed. The programme for 1935 comprises the electrification of two further sections of a single track length of about 100 miles, while for 1936 the programme comprises the electrification of eight sections totalling approximately 600 miles.

London.—RECONDITIONED INNER CIRCLE TRAINS.—The first of the reconditioned Inner Circle trains was put into service on March 8th. In place of the familiar all-brown carriage, the exterior is now painted red and cream, bearing the word "Underground" on the lower panel. The redecoration of the interior has been carried out in a scheme of blue and cream, while new upholstery, new fittings and improved lighting give additional comfort. Prominent display of the word "Circle" on the front of the train and on the side of each car assists the passengers in distinguishing between the Circle trains and those running on the main District lines. The whole of the Inner Circle trains will be reconditioned in a similar manner, and it is hoped that the programme, covering a total of ninety cars, will be completed by September.

TROLLEY-BUS INTERFERENCE.—The B.B.C. and the London Passenger Transport Board have been co-operating with a view to reducing interference by trolley-buses with radio reception. The Daventry long-wave station has been sending out special transmissions during the early hours of the morning to enable the transport engineers at Fulwell to make experiments. All the trolley-buses will be fitted with interference suppressors.

MOORGATE "UNDERGROUND" STATIONS.—Improvements are to be carried out at the Moorgate "Underground" stations to facilitate connection between the Great Northern and City and the City and South London lines, and also between the latter and the Metropolitan station. Two new escalators are to be installed.

Newcastle-on-Tyne.—TROLLEY-BUSES.—Consequent upon the Westgate Road tram route being in need of renewal, work which would cost £20,000, the City Transport Committee is shortly to consider introducing an experimental service of railless trolley-buses, to operate on the Westgate Road-Collingwood Street-Wallsend route.

Sheffield.—TRAMWAY EXTENSIONS.—The Transport Committee recommends the extensions of various tramway routes at a cost of £54,100 and has empowered the manager to continue the construction of thirty cars during the next twelve months.

South Africa.—CAPE TOWN TROLLEY-BUSES.—The Cape Electric Tramways, Ltd., has agreed with the Cape Town Finance Committee on the terms of a draft ordinance to be submitted to the Provincial Council regarding the supersession of the Cape Town tramways by electric trolley-buses. The number of vehicles required for the whole system is about 150 and fifty more for branch lines which it is proposed to convert. The company will pay the municipality £40 per annum for each vehicle operated by the company to compensate for the additional road maintenance which would fall upon the Council by reason of the conversion and to cover inspection and other expenses.

Switzerland.—RAILWAY ELECTRIFICATION.—According to a recently issued D.O.T. report, electric traction on the Federal Railway System was extended in 1932 to two lines totalling 93 km., and in the spring of 1933 to a further 80 km. of main line, thus bringing up the total length of the electrified system to 1,899 route km., or about 63 per cent. of the whole system. Electrification work is now in progress on 177 route km. In spite of their unfavourable financial situation, the State Railways do not propose at present to curtail the programme of electrification providing for the conversion of 504 route km. between 1931 and 1936. A few small private railways have also been converted to electric traction.

Traffic Signals.—The Cardiff Watch Committee has invited the Cardiff Foundry Co., Ltd., to quote for an experimental installation of its new type of revolving traffic signals.

The Sutton Coldfield Highways Committee recommends the provision of "Electromatic" traffic signals at a cost of £260.

The High Wycombe Corporation is to install traffic signals at the intersection of Easton Street, High Street, Queen Victoria Road, and Crendon Street.

Communications

European Broadcasting.—THE WAVELENGTH CONFERENCE.—Last week's *Wireless World* gave full details of the tentative plan arrived at by the delegates at the Geneva Conference of the International Broadcasting Union. The plan, which is purely experimental, is being submitted to the respective Governments for ratification, and will be put into immediate practice upon the conclusion of an agreement between Russia and Poland.

Great Britain.—RADIO RELAY SERVICES.—The Ilford Corporation committee appointed to consider overhead wires in connection with broadcast relay services has reported in favour of them, and recommends negotiation with firms desirous of installing such a service in the borough. The matter has not yet been considered by the Corporation.

K.L.M. Radio Relays, Ltd., is contemplating the question of extending its service from Barrow-in-Furness to Barrow Island.

Rediffusion, Ltd., has informed the Stafford Town Council that it is not possible to conclude arrangements for the provision of a service in the town, and the Council has agreed to the company's rights under an agreement being surrendered.

RADIO LICENCES.—During February the increase in wireless licences amounted to 67,750, bringing the total number in use to 6,192,225, or 765,746 more than a year ago.

Lithuania.—NEW TRANSMITTER.—The Kaunas (Kovno) station is to have a new 100-kW transmitter at Kleipada, says *The Wireless World*. A British firm has already tendered for the work.

London.—NEW EXCHANGE AT PADDINGTON.—On page 379 we reproduce photographs of the new telephone exchange equipment supplied by the General Electric Co., Ltd., which is now being installed at Paddington Station, Great Western Railway, under the supervision of the railway company's signal engineer, Mr. C. M. Jacobs. It comprises an automatic section for intercommunication and for outgoing local Post Office calls, and a manual board for incoming P.O. calls and outgoing P.O. and railway trunk calls, with 750 extension lines and provision for 1,000.

Morocco.—TELEPHONIC COMMUNICATION.—Arrangements have recently been completed whereby telephonic communication can be established between any of the exchanges in Morocco and Algeria.

Russia.—WORLD'S LONGEST TELEGRAPH-TELEPHONE LINE.—The *Moscow News* reports that a telegraph and telephone line is to be established between Moscow and Khabarovsk, which, it is said, will be the longest in the world. Its length will be over 5,600 miles, and will be longer than the line between New York and San Francisco. The work of erecting it is to be commenced this year. The scheme also provides for the establishment of telephone communication between Khabarovsk, Vladivostok, and Nikolaievsk, and later on with Yakutsk, so that Moscow will be placed in direct touch with the most important cities in the Far East.

Switzerland.—TELEGRAPH AND TELEPHONE PROGRESS.—The effects of the crisis on the receipts of the administration of telegraphs and telephones were felt throughout 1932. The telegraph service recorded a further decline in 1932, but it was more than offset by the expansion of telephone traffic. The total revenue of the Telegraph and Telephone Administration was 108.5 million fr. (105.9 in 1931) and the total expenditure 63.1 million fr. (62.0 in 1931). Telephone subscriptions and calls brought in 25.7 and 60.6 million fr. respectively and telegrams only 9.8 million fr. Much progress was again made in 1932 with automatic operation, which served 49.3 per cent. of subscribers, with 346,205 lines at the end of the year (324,088 in 1931). The use of underground cables steadily increased, and 89 per cent. of trunk lines had been laid underground at the end of 1932. In spite of the crisis, the Telegraph and Telephone Administration saw its revenue increase during the first nine months of 1933 to 70.3 million fr., as against 67.3 in 1931. Expenditure had increased slightly at the same time to 33.0 million fr., from 32.7 million fr. in 1931. These figures are contained in a D.O.T. report which has just been issued (2s.).

BROADCASTING PROGRESS.—The latest development was the completion of the 15-kW national transmitter on the Monte Ceneri for Italian-speaking Switzerland, which was officially placed in service at the end of October, 1933, after a prolonged period of tests. Preparations are now being made for increasing the power of the other two national transmitters at Sottens and Beromünster from 25 and 50 kW to 50 and 100 kW respectively. Moreover, a scheme for short-wave telephony for inland use is also under consideration.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—Perth.—April 19th. Western Australian Government Electricity Supply. Boiler house equipment, one 25,000-kW turbo-alternator and e.h.p. and l.p. switchgear. (February 2nd.)

Croydon.—March 27th. Electricity Department. Extension to boiler house and installation of one boiler. (March 9th.)

Dumfries.—March 26th. County Council. Various works, including electric lighting installation, for houses at Kirkconnel. Specifications, &c., from, and offers to, J. Robson, county clerk, County Buildings.

Dundee.—March 19th. Corporation. Various works, including electric lighting installation, at Paterson Street and Harcourt Street housing scheme. Particulars from city quantity surveyor, 21, City Square; tenders to Town Clerk.

Electricity Department. April 5th. A.c. meters for the year ending May 15th, 1935. (See this issue.)

Edinburgh.—March 19th. Corporation. Installation of electric lighting and power in the Central Fire Station. Forms of tender, &c., from Engineer's Office, Dewar Place (deposit £1 1s.); tenders to Town Clerk.

Eccles.—March 24th. Two metal-clad transformer and ring main e.h.p. switchgear control units. Borough electrical engineer, 1, King Street.

Epsom.—April 5th. Electricity Department. E.h.p. switchgear, metering equipment, transformers, e.h.p. cables, and mercury-arc rectifier equipment. (See this issue.)

Glasgow.—March 24th. Public Health Department. Supply of annual contracts, including electrical fittings, at hospitals. Particulars from Superintendent of Stores, Public Health Department, 23, Montrose Street; tenders to Town Clerk.

Greetland (Yorkshire).—March 21st. Alterations to the electric lighting installation at Greetland West Vale Council School. Specifications from Education Officer, County Hall, Wakefield; tenders to Sir J. Charles McGrath, clerk to the County Council, County Hall, Wakefield.

Halifax.—March 17th. Highways Committee. Traffic signals. (March 9th.)

Horwich.—March 19th. Electricity Department. Materials and stores for twelve months. T. Green, U.D.C. Surveyor, Public Hall.

Hull.—March 27th. Telephone Committee. Automatic telephone exchange. (February 9th.)

India.—Travancore.—May 7th. Government Electricity Department. Turbines, generators, switchgear, transformers, &c., for the Paliivasol hydro-electric scheme. (February 9th.)

Lochgelly (Fife).—March 24th. Town Council. Various works, including electric lighting, at 148 houses. Specifications, &c., from J. T. Scobie, architect and surveyor, 1, Douglas Street, Dunfermline (deposit £2 2s.); tenders to C. Hornal, Town Clerk, Town House, Lochgelly.

London.—Fulham.—March 28th. Borough Council. Two 75,000-kVA and two 750-kVA transformers, an electric travelling crane and three electric and five hand-operated hoist-blocks. (March 2nd.)

Great Western Railway.—April 5th. Electrical wires, cables, lamps, &c. (March 9th.)

New Zealand.—Wellington.—Posts and Telegraphs Department. April 18th. 1,000 switchboard plugs and 2,500 24-V switchboard lamps. (A.Y. 12218.)*

April 30th. Eighteen double-pole, single-throw contactors. (A.Y. 12250.)*

Public Works Department. May 8th. 6-V secondary batteries. (A.Y. 12244.)*

May 1st. Transformer oil drying and testing apparatus. (A.Y. 12252.)*

May 22nd. Battery-charging equipment. (A.Y. 12249.)*

June 5th. 50-V storage battery and charging equipment. (A.Y. 12245.)*

Northern Ireland.—Belfast.—March 20th. Tramways Committee. Fifty tramcars: bodies, trucks, electrical equipment and spares. Town Clerk (deposit £2 2s.).

March 19th. Mental Hospital Board. Electrical fittings supplies for year ending March 31st, 1935. J. Harper, secretary, Saintfield Road, Belfast.

April 6th. Electricity Department. Transformers and e.h.p. switchgear. (March 9th.)

Portsmouth.—March 20th. Electricity Department. Substation e.h.p. and l.p. switchgear and steel kiosks with switchgear. (March 9th.)

Rhondda.—March 24th. Electricity Department. Meters, copper wire, joint boxes, &c., for year ending March 31st, 1935. (February 23rd.)

Rotherham.—March 20th. Six months' supplies of electric lamps. Public Assistance Officer, Effingham Street..

Stoke-on-Trent.—April 11th. Electrical Engineer's Department. Overhead transmission lines. (See this issue.)

Stornoway.—March 24th. Town Council. Various works, including electric lighting, at housing scheme. Specifications, &c., from Burgh Surveyor, Municipal Buildings; tenders to Town Clerk.

Swansea.—March 19th. Electricity Department. One 20,000-kVA, 33,000/6,060-V transformer and sundry smaller transformers. (February 23rd.)

Tranent.—March 26th. East Lothian County Council. Various works, including electric lighting and heating installation, at additions and alterations to infant school. Particulars from County Architect, Property and Works Department, Haddington; schedules from R. and A. K. Smith, surveyors, 4, Forres Street, Edinburgh; tenders to G. Cruickshank, County Clerk, County Buildings, Haddington.

Uruguay.—Montevideo.—State Electricity Supply and Telephone Administration. April 2nd. 10,000 delta porcelain insulators and overhead transmission lines. (A.Y. 12227.)*

Whitby.—March 22nd. U.D.C. Electrical materials for year ending March 31st, 1935. (March 9th.)

Workington.—March 28th. Borough Council. Transformers, switchgear, l.p. distribution board, underground link boxes and feeder pillars. (March 9th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barrow-in-Furness.—Highways Committee. Accepted. Electric vehicle battery (£154).—D.P. Battery Co., Ltd.

Birmingham.—Bank Committee. Accepted. Electrical fittings at head offices.—Best & Lloyd, Ltd.

Education Committee. Accepted. Electric lighting equipment at schools; Audley Road—Davis & Millward; Hope Street—Gordon Hughes Electrical Co., Ltd.

Assistance Committee. Accepted. Electric lighting at Western House.—W. L. Horrobin.

Health Committee. Accepted. Electrical installations. Dudley Road Hospital—Heath Electrical Co.; Romsley Hill House—New Era Wireless & Electrical Co., Ltd.

Salvage Committee. Accepted. Electric lighting at Montagu Street depôt.—T. Glover.

Electricity Committee. Accepted. Transformers for two years.—Electric Construction Co., Ltd. Battery repairs at Prince's generating station.—Chloride Electrical Storage Co., Ltd. Switchgear and transformers at I.C.I. Metals, Ltd.—General Electric Co., Ltd. Four rotary convertor equipments at Bordesley sub-station.—British Thomson-Houston Co., Ltd.

Blackpool.—Electricity Committee. Accepted. Switchgear for two transformer stations.—Switchgear & Cowans, Ltd.; General Electric Co., Ltd.

Bootle.—Finance Committee. Recommended. Replacement of automatic telephone system at the Town Hall (£996).—Automatic Electric Co., Ltd.

Cardiff.—Transport Committee. Accepted. Trolley Wire.—Llewellyn Evans & Major, Ltd. (£157); Pirelli-General Cable Works, Ltd. (£523).

Health Committee. Accepted. Wireless equipment at Llandough Hospital (£396).—Edison Swan Electric Co., Ltd.

Electricity Committee. Accepted. Miniature control board (£83).—Metropolitan-Vickers Electrical Co., Ltd. Switch unit (£675).—Brookhirst Switchgear Co., Ltd.

Dudley.—Watch Committee. Accepted. Installation of call-bell system for fire brigade (£120).—Gent & Co., Ltd.

Hastings.—Electricity Committee. Recommended. Two 500-kVA transformers (£856).—Ferranti, Ltd.

Ilford.—Electricity Committee. Recommended. Transformers: Two 500-kVA indoor (£408) and one 500-kVA outdoor, with motor-operated tap-changing gear (£375).—British Electric Transformer Co., Ltd. Cables (schedule rates).—Metropolitan Electric Cable & Construction Co., Ltd.

Liverpool.—Corporation. Accepted. For twelve months: Electric motors and starting gear.—Higgs Motors, Ltd.; Morecambe Electrical Equipment, Co.; Erskine, Heap & Co., Ltd. Cables, compounds and tapes.—Callender's Cable & Construction Co., Ltd.; British Insulated Cables, Ltd.; Liverpool Electric Cable Co., Ltd.; Mersey Cable Works, Ltd. Electric cookers and kettles.—Automatic Electric Co., Ltd.; Edison Swan Electric Co., Ltd.

Port Sanitary and Hospitals Committee. Accepted. Electrical stores.—Lind & Co., Ltd.; Downes & Davies; General Electric Co., Ltd.; G. P. Dennis, Ltd.; British Insulated Cables, Ltd.; Baxendale & Co., Ltd.; J. A. Crabtree & Co., Ltd.; J. H. Tucker & Co., Ltd.; Howitt & Co.; Dodd & Oulton, Ltd.; Simplex Electric Co., Ltd.; Liverpool Electric Cable Co., Ltd.; Mersey Cable Works, Ltd.

London.—East Ham.—Works Committee. Recommended. Traffic signals at four points (£2,315).—Automatic Electric Co., Ltd.

Lewisham.—Highways Committee. Recommended. Traffic signals at High Road, Lee (£412).—Automatic Electric Co., Ltd.

Motherwell and Wishaw.—Town Council. Accepted. Electrical work at housing scheme (£2,291).—E. Henderson.

Northern Ireland.—Belfast.—In our last issue we incorrectly stated that W. T. Henley's Telegraph Works Co., Ltd., had obtained the contract for the supply of h.p. and l.p. cables, telephone cables and telephone boxes for the year ending March 31st, 1935. The successful tenderer was Callender's Cable & Construction Co., Ltd.

Penge.—Urban Council. Accepted. Installation of traffic control signals at Green Lane and Paris Lane (£400).—Automatic Electric Co., Ltd.

Portsmouth.—Contracts Committee. Accepted. 100 sets of "Osira" street-lighting fittings (£13 per set).—General Electric Co., Ltd.

Rotherham.—Electricity Committee. Recommended. Tough-rubber cable.—General Cable Manufacturing Co., Ltd.

Rugby.—Town Council. Accepted. Cables (£1,398).—W. T. Henley's Telegraph Works Co., Ltd. One 4,000-kVA transformer (£2,105).—English Electric Co., Ltd. Three 50-kVA distribution transformers (£420), switchgear equipment: 2,300-V (£197), 12,000-V (£236).—British Thomson-Houston Co., Ltd.

Southport.—Estates Committee. Recommended. Electric lift at Inland Revenue Offices (£416).—H. Morris, Ltd.

Stourbridge.—Worcestershire C.C. Education Committee. Accepted. Electric lighting at Orchard Land School (£118).—Abell & Smith's Electrical Co., Ltd.

Wakefield.—Library Committee. Accepted. Electrical installation at art gallery (£113).—N. Towers.

Warrington.—Sanitary Committee. Accepted. Two electric vehicle batteries.—Chloride Electrical Storage Co., Ltd.

Forthcoming Events

Electrical Association for Women.—Friday, March 16th. Regent Street, S.W.1. 3 p.m. "The Care of Electrical Apparatus." Miss D. Vaughan. Monday, March 19th. 7.30 p.m. "Large Scale Heating and Steam Cooking by Electricity." Commander F. J. Campbell Allen. (*Bristol and District Branch*).—Tuesday, March 20th. Berkeley Café, Bristol. 12.45 for 1 p.m. Annual meeting and luncheon.

Electrical Industries Benevolent Association (*South Coast Branch*).—Friday, March 16th. Grand Hotel, Brighton. Dance.

Institution of Mechanical Engineers.—Friday, March 16th. Storey's Gate, S.W.1. 6 p.m. "Mechanics of Electrical Switchgear." Mr. H. Trencham.

Junior Institution of Engineers.—Friday, March 16th. Institution, London. 7.30 p.m. "Totalisators." Mr. J. H. Broome. Friday, March 23rd. 7.30 p.m. "High Voltage Alternators and some Notes on the Properties of Insulating Materials." Mr. J. Rosen.

Physical Society.—Friday, March 16th. Imperial College of Science and Technology, S.W.7. 5 p.m. Annual meeting.

Finsbury Technical College Old Students' Association.—Saturday, March 17th. Trocadero Restaurant, W.1. 6.30 for 7 p.m. Annual dinner.

Electrical Power Engineers' Association (*London Technical Group*).—Monday, March 19th. Caxton Hall, S.W.1. 7.15 p.m. "The Mechanical Handling of Coal and Ash in a Modern Power Station." Mr. W. C. Murray.

Association of Supervising Electrical Engineers.—Tuesday, March 20th. Lighting Service Bureau, W.C.2. 7.15 p.m. "Bare Neutral Wiring." Mr. T. C. Gilbert. Thursday, March 22nd. Ship Canal House, Manchester. 7.15 p.m. "Economics of the Grid." Mr. J. M. Kennedy.

Edinburgh Electrical Society.—Wednesday, March 21st. Philosophical Institution, Edinburgh. 8 p.m. Annual meeting.

Overhead Lines Association.—Wednesday, March 21st. Institution of Electrical Engineers, London. 5.30 p.m. "Wayleaves." Mr. J. A. Sumner.

Royal Society of Arts.—Wednesday, March 21st. John Street, W.C.2. 8 p.m. "Wireless Communications with the Mount Everest Expedition, 1933." Mr. D. S. Richards.

Rugby Engineering Society.—Wednesday, March 21st. Benn Buildings, Rugby. 7.30 p.m. "Applications of the Mercury Arc Rectifier in Heavy Engineering." Mr. J. C. Read.

British Electrical Development Association.—Thursday, March 22nd. Savoy Hotel, W.C. 12.45 for 1 p.m. Annual luncheon. (*Northern Counties Area*).—Friday, March 16th. Grand Assembly Rooms, Newcastle-on-Tyne. Annual meeting and luncheon.

Institution of Electrical Engineers.—Thursday, March 22nd. Institution, London. 6 p.m. "Development in Long-distance Telephone Switching." Mr. T. S. Skillman. (*Meter and Instrument Section*).—Friday, March 16th. Institution, London. 7 p.m. Informal discussions. (*North-Eastern Students' Section*).—Saturday, March 17th. Visit to works of Messrs. C. A. Parsons & Co., Newcastle-upon-Tyne. Friday, March 23rd. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. Joint meeting with the N.E.C. Graduates. "The Science of Television." Mr. R. V. Powditch. (*South Midland Students' Section*).—Sunday March 18th. 10.30 a.m. Visit to the Dexter Pit of Messrs. Kingsbury Collieries, Ltd., Tamworth. (*London Students' Section*). —Monday, March 19th. 1.15 p.m. Visit to Broadcasting House, W.1. Friday, March 23rd. Institution, London. 6.15 p.m. Address by Mr. P. V. Hunter. Saturday, March 24th. 2.30 p.m. Visit to the National Physical Laboratory, Teddington. (*South Midland Centre*).—Monday, March 19th. James Watt Memorial Institute, Birmingham. 7 p.m. "The Measurement of Noise, with Special Reference to Engineering Noise Problems." Messrs. B. A. G. Churcher, A. J. King, and H. Davies. (*Tees-Side Sub-Centre*).—Monday, March 19th. Cleveland Technical Institute, Middlesbrough. 7 p.m. "Some Aspects of the Electrical Transmission of Power by Means of Direct Current at Very High Voltages." Mr. H. Rissik. (*Western Centre*).—Monday, March 19th. South Wales Institute of Engineers, Cardiff. 6 p.m. Informal meeting. Discussion on "The Future of Electrical Distribution." Opened by Mr. A. Ellis. (*East Midland Sub-Centre*).—Tuesday, March 20th. College of Technology, Leicester. "The Measurement of Noise, with Special Reference to Engineering Noise Problems." Messrs. B. A. G. Churcher, A. J. King, and H. Davies. (*North Midland Centre*). —Tuesday, March 20th. Hotel Metropole, Leeds. 7 p.m. Annual meeting. (*North-Western Centre*).—Tuesday, March 20th. Engineers' Club, Manchester. 7 p.m. Joint meeting with the Institution of Post Office Electrical Engineers. "Research in the British Post Office." Mr. B. S. Cohen. (*Sheffield Sub-Centre*).—Wednesday, March 21st. Royal Victoria Hotel, Sheffield. 7.30 p.m. "X-Ray Equipment in a Modern Hospital." Mr. T. W. Sampson. (*West Wales (Swansea) Sub-Centre*).—Thursday, March 22nd. Electric House, Swansea. 6 p.m. "Crank Shafts and Turbine Blades." Professor F. Bacon. (*North Midland Students' Section*).—Saturday, March 24th. Visit to works of Messrs. Yorkshire Coking & Chemical Co., Castleford.

Birmingham Electric Club.—Friday, March 23rd. Grand Hotel, Birmingham. 7 p.m. "The Industry and its Advancement—Five Points of View."

Makers' Names Wanted

Grafton soldering iron.
M.P. commutator compound.
Buoyant electric hand lamp.

Notes

The Electrical Association for Women

Miss Caroline Haslett (director), Sir John Brooke (vice-chairman of the Electricity Commissioners), and the Lord Mayor and Lady Mayoress of Cardiff (Alderman A. E. Gough and Mrs. Gough) were the principal guests at the annual dinner of the Cardiff & District branch of the Association, held at Cardiff on March 7th, Mrs. S. B. Haslam presiding. Sir John Brooke stated that during the past four years the domestic demand for electricity in this country had increased by 50 per cent., while the total demand had been greater than ever, culminating with the record increase last December of 20 per cent. over the total for the same month in the previous year. During the same period the demand for electricity had fallen in every other industrial country, owing to the trade depression. Miss Haslett described the educational and teaching work of the Association, and other speakers were the Lord Mayor of Cardiff, Mrs. C. T. Allan, Mr. A. Nichols Moore, Lady Lewis (president of the branch), Capt. J. MacLeod Carey, Mr. Arthur Ellis and Mr. J. W. Beauchamp.

Generation of Electricity in February

The official returns rendered to the Electricity Commissioners show that 1,343 million kWh was generated by authorised undertakers in Great Britain during February, as compared with the revised figure of 1,152 million kWh in the corresponding month of 1933, representing an increase of 191 million kWh or 16.5 per cent. The number of working days in the month (*i.e.*, excluding Sundays) was twenty-four, the same as last year. Adding the 1,536 million kWh generated in January brings the total kWh generated in the first two months of this year by authorised undertakers to 2,879 million kWh as compared with the revised figure of 2,490 million kWh for the corresponding period of 1933, representing an increase of 389 million kWh, or 15.6 per cent.

The Lighting of Barking Power Station

A special system of diffused lighting by "Efteelite" diffusing glass has been used at the new Barking power station. The intensity obtained on the working plane ranges from six to fifteen foot-candles. All the fittings have been specially manufactured by Messrs. Fredk. Thomas & Co., Ltd., and it is claimed that glare has been entirely eliminated. In the turbine hall there are eighty 500-W lamps, which illuminate both the ground level and roof, which is forty feet above the fittings. In the case of the pump bay, boiler house and underneath the turbine hall special arrangements have had to be made with regard to the size, type and position of the lighting source, so that even the boiler house is brightly lighted. The fittings were designed by the manufacturers' illuminating engineers in conjunction with Mr. L. C. Grant, then with Messrs. Merz & McLennan, and now principal of Messrs. Sloan & Lloyd Barnes. Some pictures of the installation appear on page 387.

Unconsciousness Produced by Electric Currents

The action of electric currents in producing unconsciousness, as distinct from fatal shock, has been investigated by Messrs. G. A. Clark and T. F. Wall in the Departments of Physiology and Electrical Engineering at Sheffield University. Cats and rabbits were rendered unconscious by the very brief application of an electric current to the head region. No permanent disability follows, and the animal appears to have no memory of the occurrence. The current employed was unidirectional, interrupted between 10 and 400 times per second; frequencies above 50 per second were most effective and the optimum voltage varied with different frequencies. The cerebral cortex vessels are constricted by the current used; stimulation of the cervical sympathetic nerves also produces constriction of the pial vessels, but stimulation of these nerves when the animal is unanæsthetised does not produce unconsciousness. Cats can be rendered unconscious electrically three weeks after the removal of the superior cervical ganglion. The cause of unconsciousness in the cases described is not cerebral anæmia. This research is described in a pamphlet obtainable from Chas. Griffin & Co., Ltd., 42, Drury Lane, W.C.2.

I.E.E. Scholarships

The Institution of Electrical Engineers invites applications, not later than April 15th, for the award of the following scholarships: Duddell, value £150 per annum for three years; Ferranti, value £250 per annum for two years, open to students and graduates of the I.E.E.; Swan, value £120 for one year, for research or post-graduate work; and Silvanus Thompson, value £100 per annum plus tuition fees for two years, open to works employés who have served an apprenticeship.

The Electrodepositors' Technical Society

The meeting of the Society for March 21st has been postponed until the 28th, when the William James Memorial Lecture will be given by Prof. R. S. Hutton.

Appointments Vacant

Electrical engineer and manager for Halifax Corporation electricity undertaking.

Showroom assistant for Ealing Corporation Electricity Department.

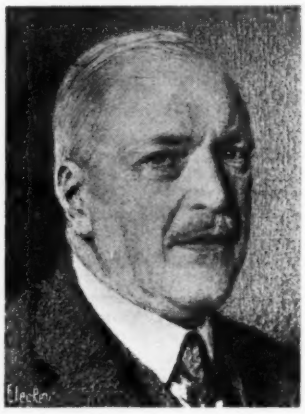
Meter and apparatus supervisor for Watford Electricity Department.

(See our classified advertisements.)

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Dr. A. F. Philips, joint founder of Philips Lamps, Ltd., celebrated his sixtieth birthday on March 14th, and this year also marks the fortieth anniversary of his association with the company. When he joined his father and brother in the management of the family factory in 1894, the concern employed forty-two hands; to-day Philips' employés all over the world total about 40,000. The growth of the company has been largely due to the work of Dr. Philips himself. Since 1922 the sole control of the undertaking has been in his hands. In 1927 his organisation was responsible for linking up the East and West Indies with Europe by means of the Philips short-wave transmitter. Dr. Philips, who preserves his energies unimpaired, is the holder of thirteen foreign decorations. He is an enthusiastic golfer, horseman, and motorist, and he is skilled in winter sports. He is also a keen art collector.



Dr. A. F. Philips

Mr. A. W. Macnamara, managing director of the Telsen Electric Co., has resigned on grounds of ill-health, and has severed his connection with the company. **Mr. W. Henderson-Cleland** has been appointed chairman of the company in place of Mr. J. W. Murray, who has resigned the chairmanship, but still remains on the board, and **Mr. A. A. Rowse** has been appointed managing director.

Mr. H. M. Green has resigned his position with the Grimsby Corporation Electricity Department in order to take up a post as senior assistant electrical engineer with the North-Eastern Electric Supply Co., Ltd. Mr. Green, who received his final technical training at the Bradford Technical College, has previously held posts at Bury, Ilkley, and Rawtenstall.

Mr. W. E. Affleck, borough electrical engineer of Guildford, has had his salary increased from £1,000 to £1,250 per annum, rising by two annual increments of £50 to £1,350.

Mr. H. Bell Thompson, managing director of Sternol, Ltd., has for the sixth year in succession been elected to the Grand Council and Executive Committee of the Federation of British Industries as representative of the British oil manufacturers.

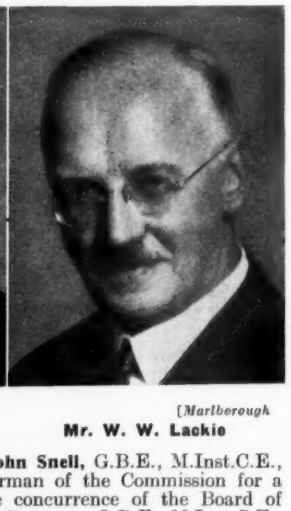
Mr. A. T. Maxwell, a partner in Glyn Mills & Co., has been appointed a director of Vickers, Ltd.

Mr. R. Cuthbert, A.M.I.E.E., has been appointed head electrician by Cowdenbeath Town Council out of eighty-nine applicants. Mr. Cuthbert is at present employed by the Fife Coal Co.

Mr. W. H. Martin has been appointed by the Chesterfield Town Council as charge engineer at the electricity works, in succession to the late Mr. A. Broughton.

Mr. W. W. Lackie, C.B.E., M.Inst.C.E., M.I.E.E., will retire from the Electricity Commission in July next. The Minister

[Elliott & Fry
Sir John Snell



[Marlborough
Mr. W. W. Lackie

of Transport has invited **Sir John Snell,** G.B.E., M.Inst.C.E., M.I.E.E., to continue as chairman of the Commission for a further period, and, with the concurrence of the Board of Trade, has appointed **Mr. J. M. Kennedy,** O.B.E., M.Inst.C.E., M.I.E.E., to be a Commissioner as from July next. Mr. Kennedy will act as chief technical member of the Commission, and will devote special attention to the problem of the distribution of electricity to the consumer.

Mr. Kennedy, who is a partner in the firm of Kennedy & Donkin, consulting engineers, Westminster, is a son of the late Prof. Sir Alexander B. W. Kennedy, LL.D., F.R.S., and was educated at Trinity College, Cambridge, where he took a Mechanical Science Tripos in 1900. He is a vice-president of the Institution of Electrical Engineers, and assisted the Commissioners throughout the preparation of the National Schemes under the Electricity (Supply) Act, 1926. He is also the adviser to the North of Ireland Government on its extensive scheme of electrical distribution.

[Davey & Taylor
Mr. J. M. Kennedy

Mr. Lackie, who will attain the age of sixty-five years in July, is one of the five original Commissioners appointed in 1920. He joined the Electricity Department of the Glasgow Corporation in 1892, and was appointed chief engineer in 1904, and manager-engineer in 1915. He is a past-president of the Incorporated Municipal Electrical Association, and the West of Scotland Institution of Engineers & Shipbuilders, and he has been chairman of the Scottish Centre of the Institution of Electrical Engineers.

Mr. W. F. Knight, the London representative of Bull Motors, Ipswich, and the Rheostatic Co., Ltd., Slough, who has been away from business owing to illness since last October, is making excellent progress, and he expects to resume his business activities some time in April.

Alderman Sir Percival Bower, the president-elect of the British Electrical Development Association, is one of the best-known public men in Birmingham. He was Lord Mayor of that city in 1924-5 and 1925-6, having been elected to the City Council in 1919. A year later he was made an alderman, was appointed a Justice of the Peace, and was awarded the M.B.E. in recognition of his services during the war as a member of the Munitions Committee. During the second year of his office as Lord Mayor he was made a Chevalier of the Legion of Honour upon a visit to France. He was knighted in January, 1927. He was a member of the Committee for England and Wales, appointed by the Association of Municipal Associations, to consider the whole field of local expenditure, at the suggestion of the Chancellor of the Exchequer. At the present time he is chairman of the Birmingham Electric Supply Committee.

[H. J. Whitlock & Sons
Ald. Sir Percival Bower

Mrs. M. M. Hutchinson, wife of Mr. Hutchinson, the electrical engineer to the Farnworth Council, has again won the Membership Cup of the Electrical Association for Women. The cup, it will be remembered, is awarded to the one introducing the largest number of new members, and this Mrs. Hutchinson has done for the year 1933, as she did for the preceding year.

Mr. Donald Sinclair, A.M.I.E.E., particulars of whose lengthy connection with the electrical industry, with Britannia Batteries, Ltd., the Chloride Electrical Storage Co., Ltd., and the General Electric Co., Ltd., were given in the ELECTRICAL REVIEW, November 17th, 1933 (p. 717), together with his portrait, is now setting up in business on his own account, specialising in electrical and mechanical engineering products. Mr. Sinclair's address is Kent House, 87, Regent Street, London, W.1. Telephone: Regent 3770.

Mr. H. G. Osborn informs us that he has resigned his position as London manager of the Kersons Manufacturing Co., Ltd. His private address is 31, Princes Park Avenue, Golders Green, N.W.11 (telephone: Speedwell 3601).

Mr. C. N. Hefford, electrical engineer and manager of the Leeds electricity undertaking, has been congratulated by the Corporation Electricity Committee upon the completion of twenty-one years' service.

Mr. Alfred T. Fleming has been appointed secretary of the Wireless League.

Mr. F. T. Tutt is recommended by the Markets Committee of the City Corporation for the appointment of principal of the electrical section of the London Central Markets at a salary of £372, rising to £450.

Mr. H. R. Kempe, former electrician to the General Post Office, is retiring from the chairmanship of the Betchworth Parish Council which he has held since the inception of the Council forty years ago.

Obituary

Sir Thomas Ryan.—The death occurred at New Delhi, on March 12th, of Sir Thomas Ryan, the Director-General of Posts and Telegraphs, at the age of fifty-five. Sir Thomas, who was an official member of the Assembly, was originally attached to the Audit Department. A *Reuter* message from New Delhi states that he was due to retire at the end of this month and had actually booked his passage home for April 9th. He joined the Indian Civil Service in 1898 as an assistant examiner.

Mr. A. H. Branwood, who was associated with the Manchester branch of Siemens Electric Lamps & Supplies, Ltd., for twenty-six years, has died at the age of forty-two. He was well known in electrical circles in Lancashire and Cheshire. The interment took place at Moston Cemetery on March 7th.

Mr. A. C. Read has died in his sixty-seventh year. He joined the late Mr. Bernard Drake and Mr. J. M. Gorham in 1886 when they went into partnership. On the formation of Drake & Gorham, Ltd., in 1901, he was appointed secretary, a position which he held up to the time of his death. In addition to his service to the company, Mr. Read acted as private secretary to Mr. Bernard Drake and his family, and was also connected with several other companies in which Mr. Drake was interested.

Mr. Gustaf Stjernberg, formerly manager of Asea Electric, Ltd., London, died at Västeras, Sweden, on March 5th. Before the War he acted as manager for the A.E.G., and was responsible for the electrification of a number of South Wales collieries.

Mr. W. J. Dann.—The death has occurred, at the age of fifty-three years, of Mr. Walter James Dann, Meopham, Kent, who was for many years on the staff of the General Electric Co., Ltd.

Mr. F. H. Briggs, general manager of the Tyneside Tramways and Tramroads Co., Wallsend, died on March 3rd, in his fiftieth year. He went to Tyneside after serving his apprenticeship in Halifax, and was with the Newcastle-on-Tyne Electric Supply Co. for about two years. He joined the Tyneside Tramways Co. in 1905 as resident engineer, and became engineer and manager in 1928. He was an associate member of the Institution of Electrical Engineers.

Mr. J. W. Brown, a director of Messrs. Johnson, Matthey & Co., Ltd., died in London on March 11th.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Hygrade Electric, Ltd.—Private company. Registered March 5th. Capital, £1,500 in £1 shares. Objects: To acquire and operate the condenser and transformer manufacturing plant, the property of S. D. C. Orchard, and to carry on the business of manufacturers and sellers of condensers, transformers, electrical and radio equipment and parts, bakelite casings, &c. The directors are: S. D. C. Orchard, electrical and radio engineer, and Mrs. Agnes M. Orchard, both of 2, Devonshire Mansions, The Polygon, Southampton. Registered office: 17a, Park Road, Freemantle, Southampton.

Electrical Leakage Detectors, Ltd.—Private company. Registered March 5th. Capital, £100 in £1 shares. Objects: To manufacture and market electrical fittings and appliances; to carry on business as engineers, factors and merchants, &c. The first directors are: T. Porter, Hawksview, Merrow, Guildford; A. Marsden, Norbrook Cottage, Leith Park Road, Gravesend; and C. H. L. George, 48, Combe Road, New Malden. Registered Office: 68, Victoria Street, S.W.1.

Shalless & Evans, Ltd.—Private company. Registered March 7th. Capital, £5,000 in £1 shares. Objects: To acquire the business of radio manufacturers and distributors carried on by E. G. Shalless and H. Evans at 8, Havelock Street, Forest Hill, S.E., and to carry on the business of electricians, &c. The first directors are: E. G. Shalless, Gordon House, Blackheath Park, S.E.3; and H. Evans, 31, Riverview Park, Catford, S.E.6. Secretary: J. T. Hopkins. Registered office: 8, Havelock Street, Forest Hill, S.E.23.

City Auto, Ltd.—Private company. Registered March 8th. Capital, £250 in £1 shares. Objects: To carry on the business of electrical and mechanical engineers, manufacturers of and dealers in dynamos, accumulators, lamps, valves and apparatus, manufacturers of and dealers in motor cars and petrol engines, panel beaters, &c. The directors are: A. Fell, 32, Chudleigh Way, Ruislip Manor, Middlesex, R. G. Clarke, 11, Central Road, Wembley, Middlesex, T. E. Bowker, 22, Rayleigh Road, North Hyde, Southall, Middlesex, and F. S. Buckingham, 60, Central Road, Wembley, Middlesex. Registered office: The Garage, Maybank Avenue, Sudbury, Wembley, Middlesex.

Rowe's Radio & Electrical Service, Ltd.—Private company. Registered March 10th. Capital, £100 in £1 shares. Objects: To acquire the business of Rowe's Radio and Electrical Service now carried on by Geoffrey S. Rowbotham at 308, High Street, Sutton, Surrey. The permanent directors are: G. S. Rowbotham (managing director), The Willows Bungalow, Oakhill Road, Sutton, Surrey, and C. E. K. Rowbotham, address not stated.

Rawswood Radio Corporation, Ltd.—Private company. Registered March 8th. Capital, £3,000 in £1 shares. Objects: To carry on business as manufacturers of and dealers in wireless and electrical components, &c. The directors are: A. Wood, 28, South Park Drive, Blackpool, Mrs. Gladys M. M. Wood, 28, South Park Drive, Blackpool, and J. B. Houghton, 400, London Road, Harraby, Carlisle. Registered office: Preston New Road, Little Marton, Blackpool.

Stanalite Human Switch Co., Ltd.—Private company. Registered March 9th. Capital, £100 in £1 shares. Objects: To acquire all or any part of any inventions, processes, rights, patents, &c. The subscribers (each with one share) are: A. J. Le Vaye, 7, Lowther Road, Barnes, S.W.13, L. S. Lewis, 11, St. Stephens Road, Bayswater, W.2, and A. J. Le Vaye is the first director. Registered office: Eagle House, 110, Jermyn Street, S.W.1.

Returns of Electrical Companies

Davey, Paxman & Co. (Colchester), Ltd.—Satisfaction to the extent of £23,840 on December 13th, 1933, of mortgage debenture stock authorised August 4th, 1932, and registered August 26th, 1932. (According to the register of mortgages, the debenture stock registered August 26th, 1932, originally secured £80,000.)

F. E. Godfrey (Radio), Ltd.—The nominal capital has been increased by the addition of £2,000 in £1 ordinary shares beyond the registered capital of £1,000.

Llanelly and District Electric Supply Co., Ltd.—Satisfaction to the extent of £350,000 on or before December 15th, 1933, of 5 per cent. debenture stock secured by trust deeds dated August 3rd, 1911, to November 30th, 1931, and registered August 16th, 1911, and December 11th, 1931, and mortgages dated September 1st, 1911, and June 16th, 1925, and registered September 13th, 1911, and June 22nd, 1931, respectively.

"M. P. A." Wireless, Ltd. (old company).—J. J. Ure, 11a, Hart Street, W.C.1, ceased to act as receiver and manager on March 1st, 1934.

North-Eastern Electric Supply Co., Ltd.—An issue on February 20th, 1934, of £500,000 debentures (part of a series already registered) has been notified.

Rhondda Tramways Co., Ltd.—Particulars filed of £75,000 5 per cent. prior lien debenture stock authorised September 14th, 1933, and covered by deed poll dated February 27th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Siemens-Schuckert (Great Britain), Ltd.—Satisfaction to the extent of £5,086 (balance owing) on January 21st, 1934, of mortgage dated January 26th, 1933, and registered February 14th, 1933.

Phœnix Telephone & Electric Works, Ltd.—Charge on lands, &c., at Hendon, dated February 22nd, 1934, to secure all moneys due or to become due from the company to the Westminster Bank, Ltd.

R. C. & Wilson Electric, Ltd.—Francis R. Turner, of 56, Chasefield Road, S.W.17, was appointed receiver and manager on March 8th, 1934, under powers contained in debentures dated October 3rd, 1929, and January 9th, 1930.

City Notes

The County of London Electric Supply Co., Ltd., reports a balance of £1,721,489 for 1933, as compared with £1,559,521 in the preceding year; to this is added £272,005 brought in and interest charged to capital (Barking supply) of £45,368, making a total of £2,038,862 available. After deducting debenture interest, &c., and placing £489,109 to depreciation reserve, £50,000 to general reserve, £38,272 to contingency fund, £20,000 to taxation reserve, £6,326 to investment reserve, and providing for the difference between the issue and redemption prices of debenture stock, it is proposed to pay a final ordinary dividend of 7½ per cent., maintaining the distribution for the year at 10½ per cent., and to carry forward £347,042. The report states that the sales of electricity totalled 693,374,135 kWh, as compared with 604,599,133 kWh for the previous year, an increase of 88,775,002 kWh. The negotiations in respect of the fixing of the standard prices in pursuance of the London Electricity (No. 1) Act, 1925, were completed during the year and the new standard prices, which operate as from January 1st have received the approval of the Electricity Commissioners. The power stations at Barking and Wandsworth commenced

operating as "selected stations" under the South-East England Electricity Scheme as from January 1st last. During the year, agreement was reached with the local authorities holding purchase rights over the company's undertaking in the area of the Croydon Rural Order, 1905, whereby the company's tenure is to be extended, and arising out of this agreement, the approval of the Electricity Commissioners has been obtained to the acquisition of the Caterham and Woldingham undertakings. The new section of Barking power station has been completed and a further 150,000 kW of plant put into service. The total capacity of the station is now 390,000 kW. During the year the company's transmission and distribution network was increased by 276 miles of underground mains and overhead lines, whilst eighty transforming stations were put into commission. New showrooms and branch offices have been opened at Loughton, and others are about to be opened at Maldon, Saffron Walden and Upminster. The system of continuous meter reading introduced at the beginning of the year has proved satisfactory. The associated companies continue to show increased progress. Following the annual meeting on March 20th, an extraordinary meeting will be held at which a resolution will be submitted empowering the board to issue preference shares on terms more consistent with market conditions of to-day than those attaching to unissued preference shares which, under the existing authorisation, rank *pari passu* with the preference shares already issued.

The Charing Cross Electricity Supply Co., Ltd., held its annual meeting on March 7th, Sir Francis Fladgate (chairman) presiding. In presenting the report and accounts (ELECTRICAL REVIEW, March 2nd, page 328), the chairman said that their area was almost exclusively a business one, and therefore they had felt the effect of trade depression more acutely than in those areas which had a proportion of residential customers. In addition, the long warm summer had a very definite effect on their business. The increase in sales, therefore, of 3½ million kWh was satisfactory, and they had succeeded in connecting 5,000 kW of new load to their mains. As was indicated at the last meeting, they had reduced their tariffs in the West End and altered the tariffs in the City in the consumers' favour. The average overall price had dropped from 2.02d. to 1.92d. per kWh, and the effect of these reductions had been estimated as a benefit to the consumers of £20,000 in both the City and West End undertakings. The revenue of both undertakings had shown a slight decrease, but the increased sale of electricity had to some extent made up for the reduction in price. The expenses in both undertakings showed a material decrease. The heavy increase in their peak load in the first months of the current year would prevent them from earning such a good rate under the tariff by which they purchased their electricity from the London Power Co., but this increase in demand had been coupled with a healthy increase in kWh sold. The sum carried forward from the West End undertakings was substantially in excess of that fixed by the Act of 1925, and they therefore proposed, after allowing for payment of the appropriate share of the consumers' benefit and after making allowance for the possible increase in the price of bulk supply, to make such reductions in price as would reduce this carry-forward to a substantially lower figure. They had spent on capital account during the year the sum of £93,433, which had been largely incurred in the extension of their new a.c. network. They had redeemed £80,000 of the 4½ per cent. City undertaking debenture stock during the year.

The Kensington & Knightsbridge Electric Lighting Co., Ltd., held its annual meeting on March 8th, when Col. R. E. Crompton (chairman), who presided, said that the capital expenditure during the year was mainly for three new a.c. static sub-stations, extensions to a.c. l.p. mains, and expenditure on hire apparatus. They had formed a subsidiary company under the title of Kenbridge Estates, Ltd., which had acquired their interest in the site immediately adjoining their head office in Pelham Street at cost, and a block of modern "all-electric" flats and shops was now in course of erection. It would shortly be necessary for the Kenbridge Company to issue debenture stock to cover the cost of building, and it was their intention to guarantee the interest on this stock. Existing shareholders would be given a preferential opportunity of subscribing for the stock. Their sales of electricity during the year had increased by nearly 6 per cent., in spite of the abnormally fine summer. The development of the domestic load had continued and the number of cookers connected on hire increased during the year by 30 per cent. and the number of water heaters by over 100 per cent. The domestic two-part tariff, introduced in 1932, had been well received and consumers under this tariff in 1933 obtained a supply at the low overall average price of 1.39d. per kWh. Their new showrooms in Brompton Road had now been in operation for just over twelve months and had fully justified expectations. Referring to criticism in the daily Press and by other methods of the electricity supply industry, which was accused of apathy and inefficiency, he said that in spite of trade depression the industry was able to show a steady increase of business year by year. He had witnessed the over-expansion of the industry in its early days and the consequent setback it had experienced from which it took years to recover. This period was followed by a reasonable and productive expansion more in accordance with the law of supply and demand. In spite of the recent failure of certain experimental schemes, due to over-rapid development, the critics would have the industry follow their example. In his opinion the electricity supply industry had no reason to expect any sudden spectacular increase in business.

The Shropshire, Worcestershire and Staffordshire Electric Power Co. reports net receipts for 1933 of £577,796, as compared with £533,017 for 1932, and after deducting rates, directors' fees, debenture and other interest, a net profit of £363,581, as against £324,932. It is proposed to pay final dividends of 4 per cent. upon the "A" ordinary shares, making 8 per cent. for the year, and 2½ per cent. on the "B" ordinary shares, making 5 per cent. (unchanged) and to place £123,331 to reserve appropriation account. After adding to this account contributions in respect of new services and £85,519 brought in, it is proposed to place £152,264 to reserve and to carry forward £75,884. The capital expenditure during the year upon plant and machinery, trunk and distribution mains, new sub-stations, &c., amounted to £316,575. Approximately 138 miles of overhead mains and underground cables were brought into service, making a total length at the end of the year of about 1,665 miles, excluding services. Supplies of electricity were made available in four new districts. The Hereford Electricity (Extension) Special Order, 1933, covering part of the urban district of Ross-on-Wye, was granted during the year. The total number of consumers supplied by the company and its subsidiaries (excluding the South Wales Electric Power Co.), at December 31st showed an increase of about 19 per cent. over the preceding year. A Special Order was made in December last increasing the nominal capital by £1,000,000 to £5,500,000 and the borrowing powers of the company by a like amount to £4,125,000. Meeting: March 28th.

The Enfield Cable Works, Ltd., held its annual meeting on March 10th, when the Earl of Verulam (chairman), who presided, said that in the first six months of the year under review orders had been even scarcer than in 1932, the turnover falling to less than one-third of the peak figure for a similar period four or five years ago. In the latter half of the year, however, there had been some recovery, and the opening months of the current year had maintained the improvement. They had a long way to go before they got back to the volume of orders of 1927-30, but there was no doubt that there was more confidence about, more money was available for spending and more orders were being placed. During each of the last four years they had paid in dividends £115,000, and it would have been possible to repeat the distribution by absorbing the whole of the profit on realisation of investments, the whole of last year's carry-forward and appropriating £2,000 from reserves. The board decided that the better course would be to recommend a reduction in the dividend to 20 per cent. for the year. Regarding the current year prospects were definitely brighter. They had made a loss on Enfield Cable Works (Australasia), Ltd., and there was now a debit balance of £4,500 standing on that account which had not been dealt with in the Enfield accounts. In Australia, however, as well as over here, there was a definite improvement in outlook, but both there and here they had a long way to go before they got back to the level of the best years of the past decade.

The North-Eastern Electric Supply Co., Ltd., reports a profit for the year ended December 31st last of £1,010,748, as compared with £947,531 in the preceding year, against which is charged debenture interest, &c., £227,965, transfer to reserve for special depreciation and contingencies, other than equalisation of dividends, £250,000, and transfer to reserve for plant renewals and improvements, £50,000, leaving £482,783; to this is added £74,807 brought forward, making £557,590. It is proposed to pay a final dividend on the ordinary shares of 3½ per cent. again, making 6 per cent. for the year, and to carry forward £86,513. The capital expenditure on works during the year amounted to £467,721, and mainly represented extensions to the distribution system. An offer of £2,500,000 3½ per cent. consolidated debenture stock made in October last was largely over-subscribed. The purpose of this issue was primarily to enable the company to redeem its outstanding 4½ per cent. consolidated first mortgage debenture stock amounting to £2,110,908. Satisfactory progress continues to be made in changing over plant from 40 to 50 cycles in connection with the standardisation of frequency under the North East England Electricity Scheme. The report records the death of Mr. J. Tennant, a director, and the intention to increase the present membership of the board by the addition of two directors. Meeting: March 20th.

Lancashire Dynamo & Crypto, Ltd., reports a net profit for 1933 of £7,941, as against £7,859 in 1932, to which is added £8,310 brought in, making £16,251. It is proposed to pay an ordinary dividend of 2½ per cent. (same) and to carry forward £8,901. The report states that the depressed trade conditions experienced in the industry during the last few years showed a tendency to improve towards the end of the period under review. Excessive competition, however, continued to keep prices at an uneconomic level. Satisfactory progress was made during the year in the food machinery department at the Willesden works. Meeting: March 20th.

The Svenska Allmänna Elektriska A.B., in its report, states that the exports somewhat diminished in 1933, and the home-market assumed greater importance. New orders were booked last year for Finland, Denmark, England, Belgium, Spain, India and South Africa. The report does not give any information concerning the volume of manufacturing and sales. The net profits are returned at 4.53 million kronen, as compared with 5.19 millions in the previous year, and the dividend is 6 per cent. as against 7 per cent. in 1932.

Edmundson's Electricity Corporation, Ltd., reports that during February the electrical energy generated and purchased by its undertakings totalled 45,498,000 kWh. as compared with 38,625,000 kWh in February, 1933, an increase of 18 per cent. The total for the first two months of the current year was 98,363,000 kWh. an increase of 19 per cent., as compared with the corresponding period of last year.

British Insulated Cables, Ltd., propose to pay a final ordinary dividend of 10 per cent., making 15 per cent. for the year (unchanged). A preliminary statement issued by the company shows a profit of £517,000 for 1933, against £589,275 for 1932. Depreciation reserve receives £160,000 (against £220,000) and £300,000 is carried forward, against £290,000 brought in.

Waygood-Otis, Ltd., reports a net profit for 1933 of £90,054, as compared with £89,050 in 1932. A final dividend of 2½ per cent. and a bonus of 10 per cent. are proposed on the ordinary shares, maintaining the distribution for the year at 25 per cent., and £28,800 is carried forward.

The International Automatic Telephone Co., Ltd., reports that the profit for 1933 was £87,361 after providing for directors' fees, writing down patents of goodwill, &c., as compared with £134,653 for 1932. To this is added £88,013 brought in, making £175,374. The ordinary and deferred dividends are 8 per cent., against 10 per cent. for 1932, and £77,824 is carried forward. The directors state that the demand for public telephone exchange equipment fell substantially during the early part of 1933, and it was only during the later months that conditions

became more normal. This irregular demand adversely affected the company's earnings and investment income and the trading results of the subsidiary company—the Automatic Electric Co., Ltd. In view of the improved prospects for 1934 and the substantial reserves of both companies a dividend in excess of the net earnings is recommended. Owing to the pressure of other business engagements, Mr. G. H. Nisbett, J.P., resigned from the board in November last, and Mr. A. F. Adams has been appointed a director. Meeting: March 23rd.

The Metropolitan Electric Supply Co., Ltd., held its annual meeting on March 13th, Mr. G. Balfour (chairman) presiding. In presenting the report and accounts the chairman said that they recorded steady progress in sale of electricity, load connected, &c., the slight difference in revenue being anticipated and entirely due to further reductions in tariffs during the year. Ten years ago their total investment in subsidiary electricity supply companies was only £200,000 in one company, whereas they had now over £1,600,000 invested in seven such subsidiaries, six of which were within their bulk supply area. They were prepared to continue the consolidation and improvement and take over the remaining isolated undertakings within their bulk supply area. The "Metesco" "all-in electricity service" annual contract had now been accepted by approximately 24,000 customers. The low rate of this tariff, which was standard at ¾d. per kWh in all districts, had encouraged the domestic consumer to use electricity for heating, cooking, and other household purposes. Their hire-of-apparatus service was appreciated by the tenants in the large number of new houses recently built in their western districts. Cookers and wash-boilers had been installed in many of these houses on hire from the company. Altogether at the end of the year there were nearly 5,500 electric cookers and 1,100 water heaters of various types out on hire, in addition to the large number owned by the consumers. They had at least definitely popularised the two-part tariff for domestic purposes, and the results had justified their efforts. The 24,000 domestic consumers now on this tariff averaged 1.81d. per kWh, ranging from as low as 0.84d., and their average consumption was 1,800 kWh per annum, as compared with about 300 kWh per annum when on the "unit" flat rate. Their experience had been that propaganda by leaflets and literature played but a small part in pushing sales. Although they kept intensive propaganda going all the time, it was by the local Press, personal contact, demonstration, and canvassing that the business was secured upon a proper basis. At the end of the year the total number of consumers supplied direct by the company or through its subsidiaries was 102,260, an increase during the year of 13,257, or 15 per cent. The increase in kWh sold was satisfactory, the total being 223,342,000 kWh, as compared with 202,085,000 kWh for the previous year, an increase of 10.5 per cent. The whole of the addition, with the exception of 200,000 kWh increase in the London area, was accounted for by the increased consumption in the western area and increased business by their subsidiaries. During the first few months of the current year the consumption had increased at a favourable rate. During the last ten years the sales had increased five-fold from 45,000,000 kWh in 1923 to 223,000,000 kWh last year, the average price during this period falling from 3.23d. to 1.15d. per kWh. Last year they made reductions in charges to customers totalling about £50,000. During December they issued the balance of the unissued ordinary shares, namely, 160,000 shares of £1 each to shareholders at 40s. per share, thus completing the issue of the whole of the authorised £2,500,000.

The City of London Electric Lighting Co., Ltd., reports that the balance of net revenue available for dividends, &c., for the past year is £243,966. Of this the standard dividends absorb £160,000, leaving a balance subject to the allocation to co-partners' fund and to adjustment when the revised standard prices have been fixed by the Electricity Commissioners of £83,966. The ordinary dividend has been maintained at the same level since 1921. During the year £96,942 was spent on capital account, mainly in the provision of heavy switchgear and protective devices in view of the approaching connection of the company's generating station to the grid. It is anticipated that the Central Board's sub-station now in course of erection alongside the company's power station will be connected up in the course of the next few months. This will enable the company to give or take a supply up to 60,000 kW. The report refers to the retirement, owing to ill-health, of Mr. J. Cecil Bull, the managing director, and the appointment of Mr. A. F. Harrison to the position. Meeting: March 21st.

The Constantinople Telephone Co. will hold a meeting of obligation and certificate holders on March 27th at which resolutions will be submitted postponing repayment of their securities which fall due on June 30th next.

Companies Struck off the Register.—The names of the following companies have been struck off the Register and they are thereby dissolved:—Electric Time Systems, Ltd.; Premier Battery & Magneto Co., Ltd.

The Brazilian Traction, Light & Power Co. has declared a quarterly dividend of 1¼ per cent. on the 6 per cent. cumulative preference shares.

The Lancashire Electric Light & Power Co. has announced a final dividend of 5 per cent., making 7½ per cent. for 1933, against 7 per cent. for the preceding year.

The Rangoon Electric Tramway & Supply Co., Ltd., has declared a final ordinary dividend of 14 annas per share, free of Indian tax, making 20 annas for 1933 (same).

Ward & Goldstone, Ltd., have declared the usual final dividend for the year on the cumulative preference shares at the rate of 7 per cent. per annum.

The Canadian General Electric Co. is paying a quarterly dividend on the common stock of 75 cents per share to March 31st.

A night view of New York during the recent blizzards enhancing its appearance as a "City of Light"

The Kidderminster & District Electric Supply Co., Ltd., reports net receipts for 1933 of £11,411 (against £9,576). The ordinary dividend is again 5 per cent. and £1,100 is carried forward. Major G. H. G. M. Cartwright and Mr. J. T. H. Legge have resigned from the board, but Mr. Legge retains an interest in the company through his association with the parent company. Mr. A. Winterbottom and Cmdr. R. B. Bates have been elected to the board.

Pinchin, Johnson & Co., Ltd., report a net profit for 1933 of £250,956, as against £220,997 in the previous year, which with £47,053 brought in makes £298,009 available. It is proposed to pay a final ordinary dividend of 9 per cent., maintaining the distribution for the year at 15 per cent., and to carry forward £48,330.

The British Aluminium Co. reports a net profit of £162,830 for 1933, including the amount brought in, and after deducting taxation, debenture interest, and placing £50,000 to depreciation reserve, as compared with £162,031 for the preceding year. The ordinary dividend is maintained at 5 per cent. and £52,778 is carried forward.

Vince's Dry Batteries, Ltd., in its first report for the period November 27th, 1932, to November 30th, 1933, shows a net profit of £5,409, plus £9,344 brought in. An interim dividend at 10 per cent. per annum for two months to June 30th last absorbed £884, leaving a balance of £13,870. Meeting: March 17th.

The Hoffmann Manufacturing Co., Ltd., reports a profit of £89,863 for 1933, as against £70,314 in the previous year, to which is added £49,926 brought in, making £139,789. The ordinary dividend is 7½ per cent., against 5 per cent. for 1932, and £50,529 is carried forward.

The Anglo-American Telegraph Co. has announced quarterly dividends of ¾ per cent. on the ordinary stock and 1½ per cent. on the preferred ordinary stock.

Stocks and Shares

Tuesday Evening.

WHAT few signs are discernible of easier prices in the Stock Exchange may be attributed more to selling on behalf of speculators than to any other cause. Many people who bought stocks and shares earlier in the year did so at materially lower prices than obtain to-day, and there is nothing surprising in the desire to secure substantial profits. The strong upward movement in the market for electricity supply shares has received a mild check, though the recent advances are, with very few exceptions, wholly retained. A feature during the past week has been the weakness of London Passenger Transport "C" stock, which fell from 83 to nearly 9 points lower before any kind of rally occurred. American-Canadian-Brazilian issues are attracting an unwonted degree of attention from the public upon both sides of the Atlantic.

Central Board and London Transport

Central Board fives, of both issues, and West Midlands Joint Electricity fives are all a point higher. The lately issued Galloway Power 4 per cent. debenture keeps its premium of 2½ points above the issue price of 101¼. By some people this stock is regarded as preferable to Central Electricity fours of 1959-1989, the price of which is 104, cum a half-yearly interest payment due on May 1st. The first interest payment, of £1 4s. 6d. per cent., on the Galloway Power fours will be paid next October.

London Passenger Transport stocks have suffered from the effects of Lord Ashfield's jeremiads, mentioned here last week, relating to the small margin of profit that the Board earns. Curiously enough, his Lordship's speech had no immediate influence. Two or three days later, however, selling began in earnest. The "C" stock fell, not by quarters or by ten shillings, but by points at a time. Nor was any effort made to pick up cheap stock until the price, at 74½, was 8½ down. A little buying sufficed to restore 2 points, but at 76½ there is still a fall of 6½ on the week.

London Electricity Supply

Considering the rises that have taken place during the past fortnight in the shares of the home electricity supply companies, it is no more than natural to find prices showing comparatively few movements. In the London group, County ordinary shares are a shade better at the round £3 per share on the publication of the accounts, which show a further remarkable increase in the company's revenue. The County of London has a little over £2,000,000 available for distribution, and the dividend is again made up to 10½ per cent., for the third successive year, comparing with 11 per cent. for 1930. The carry-forward of £347,000 is substantially increased, and the figures show improvement in practically every department.

Metropolitan Electrics at 56s. 3d. have lost the 9d. gained a week ago, and North Metropolitan ordinary at 65s. are ⅛ lower. Other London shares maintain their prices, the market as a whole being decidedly strong. London Power 4 per cent. debenture has risen 2 to 107½. The new stock, issued at 104, and now 44 per cent. paid, stands at 1½ premium.

Provincial Shares Strong

Amongst provincial shares, the upward tendency is again in evidence. Bournemouth & Poole have risen to £4, Lancashire Light & Power to £2, Yorkshire Electrics to 50s., the last-named advancing to the same level as that occupied by Electrical Distribution of Yorkshire shares. North-Eastern Electrics keep hard at 36s. The company's report, out this week, shows that the earnings have topped a million pounds. The 6 per cent. dividend on the ordinary shares absorbs £40,000 more than it did to pay the same rate a year ago, owing to the extra capital that now ranks for dividend. Bournemouth 4½ per cent. debenture has risen to 108. West Gloucestershire 6½ per cent. participating preference at 112 is 5 points up; the ordinary at 72 shows a gain of 3. Midland Counties preference strengthened to 30s. Edmundson's ordinary eased off to 41s. 6d. Llanellys are 26s. 6d., Hendons 59s. 3d., and Richmonds 56s. 6d. The lately issued Electrical Distribution of Yorkshire new preference came on offer at 5s. 6d. premium, after being rather better.

In the colonial group, Victoria Falls ordinary are a good market at 5¾. The preference at 41s. 6d. have gained a few pence.

Cables and Wireless

After the healthy recovery which Cables & Wireless stocks sustained a week ago, business has halted, and prices are left with little change on the week. The "B" ordinary stock has gone back to 10½. This stock is, of course, little better than a gambling counter, or what the Stock Exchange calls "option money," as things are at present. Its prospects of a dividend appear to be very remote. Yet this is the stock which, it may be recalled, soon after the Cables & Wireless were introduced to the market, stood at over 100, on the assumption that Americans would buy it for the sake of the equity which it connoted! Great Northern Telegraphs are another 20s. higher at 37, and the strength of the Anglo-American group is well maintained, the 6 per cent. stock at 113½ showing a gain of the fraction. American Telephone & Telegraphs are up a point, with Internationals similarly better at 15.

Manufacturing Companies' Shares

British Insulated Cables, Ltd., whose shares are colloquially known in the Stock Exchange as "Wires," announces a profit for 1933 of £517,000, which is about £63,000 less than that secured in the previous year. The dividend is repeated at 15 per cent., and the price of the shares remains at 72s. 6d. The yield, allowing for accrued dividend in the price, is 4¼ per cent. on the money. That the profits would be considerably lower than those of 1932, anticipation had looked for, but the decrease is larger than optimism forecast. The list of manufacturing companies' shares is accordingly disposed to be a trifle easier. Callenders drooped to 61s. 3d., Henleys to 6¼. Johnson & Phillips hold most of their previous gain, being quoted at 22s. 6d. Ever-Ready 5s. shares recovered 1s. to 30s., and the new shares, offered at 29s. 6d., now stand at "par," instead of their previous small discount. International Automatic Telephone has reduced its dividend for the year to 8 per cent., against 10 per cent., this applying to the ordinary and the deferred shares alike. The prices of both classes are quoted at 33s. 3d. Johnson & Phillips have advanced to 22s. 6d.: the price was 20s. a fortnight ago. Enfield Rolling Mills show ⅛ fall at 30s. 6d.

Miscellaneous Matters

With a rise of 30 points, British Electric Traction deferred has put on a century in a couple of weeks, the present price being 590. Reference was made in last week's notes to the impression that 700 might not be too extravagant a price for the stock to reach. The 8 per cent. preferred stock is 5 up, at 157½: for some time past, the floating supply has been inadequate to satisfy the demand.

Babcock & Wilcox have reacted to 44s. 6d. Iron and steel shares are inclined to be hesitating. Rubber is better than it has been for many months, but this fails to induce any public interest in the market for rubber shares.

Baird Television preferred ordinary and deferred are a little better at 2s.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1931.	1932.	Price. Mar. 13.	Rise or Fall.	Yield. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	4	+⅛	3 15 0
Brompton Ordinary	1	8½	7	34/6	—	4 1 2
Charing Cross Ordinary	1	8½	7	35/6	—	3 19 0
Chelsea	1	8½	7	34/6	—	4 1 2
City of London	1	10	7½	37/-	+9d.	4 1 1
Clyde Valley	1	7	7	42/-	—	3 6 6
County of London	1	10½	10½	60/-	+6d.	3 10 0
Edmundson's 7% Pref.	1	7	7	34/-	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	2½	—	3 12 0
Elec. Supply Corporation ...	1	11	11	77/6	—	2 16 9
Kensington Ordinary	1	8	7	35/6	—	3 19 0
Lancs Light and Power	1	7	7	2	+⅛	3 10 0
London Electric	1	9	7	35/6	—	3 19 0
Metropolitan	1	10	10	56/3	—9d.	3 11 3
Midland Counties	1	7	7	40/9	+9d.	3 8 8
Mid. Elec. Power	1	8	8	43/9	—	3 13 0
North Eastern Electric Ordinary	1	6	6	36/-	—	3 6 8
Do. 7% Pref.	1	7	7	34/-	—	4 2 4
Northampton	1	10	10	57/6	—	3 9 6
Notting Hill 6% Pref.	10	6	6	13¾	—	4 8 11
North Met. Elec. Ordinary ...	1	—	10	3½	—⅛	3 1 5
Do. do. 6% Pref. ...	1	6	6	30/-	—	4 0 0
St. James' and Pall Mall ...	1	8	7	36/-	—	4 3 4
Scottish Power	1	8	8	2	—	3 13 1
South London	1	8½	7	35/-	—	4 0 0
Westminster Ordinary	1	8¾	7	35/-xd	—	4 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/-	—	6 16 4
Yorkshire Elec.	1	8	8	2½	+3d.	3 4 0
PUBLIC BOARDS.						
Central Electricity, 1950–70 ...	Stock	5	5	113	+1	4 8 6
Do. 1955–75 ...	,,	5	5	114	+1	4 7 9
Do. 1951–73 ...	,,	4½	4½	108	—	4 3 4
Do. 1963–93 ...	,,	—	3½	95½	—	3 13 4
London & Home Counties, 1955–75	,,	4½	4½	109	—	4 2 7
London Passenger Transport, A...	,,	—	4½	118½	—	3 16 0
Do. do. B...	,,	—	5	121½	—1½	4 2 4
Do. do. C...	,,	—	—	76½	—6½	—
West Midlands Joint Elec. 1948–68	,,	—	5	113	+1	4 8 6
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	122½	+1	7 7 0
Anglo-Am. Tel. Pref.	Stock	6	6	113½	+½	5 5 9
Do. Def.	,,	1½	1½	28	—	5 7 2
Cables & Wireless 5½% Pref. ...	,,	2¾	2¾	73½	—	3 14 10
Do. A 7½% Ord.	,,	Nil	Nil	23	—1	—
Do. B. Ord.	,,	Nil	Nil	10½	—½	—
Globe Tel. and T. Ord.	10	Nil	2½	10	—	2 10 0
Do. do. Pref.	10	6	6	13	—	4 12 4
Great Northern Tel.	10	20	20	37	+1	5 8 1
Marconi-Marine	1	10	7½	28/9	—	5 4 2
Oriental Telephone Ord.	1	12	12	3½	—	*3 16 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	2/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	6	—	—
British Electric Traction Df. Ord.	,,	5	5	590	+30	—
Do. do. Pref. Ord.	,,	8	8	157½	+5	5 1 7
Brazil Traction	100	—	—	12	+½	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	102½	—	4 17 6
Mexico Trams, 5% Bonds ...	—	5	5	19½	—	25 12 8
Mexican Light Common	100	Nil	Nil	8	—	—
Do. 7% Pref.	100	7	7	11	—	—
Do. 1st Bonds...	—	5	5	50½	+3	9 18 0
Victoria Falls Ord.	1	15	20	5¾	+⅛	3 12 0
Yorkshire (West Riding) ...	1	Nil	Nil	1	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	4	4	18/3	—1/-	4 7 8
Do. Pref.	1	8	8	31/3	—	5 2 5
Babcock & Wilcox	1	14	9	44/6	—1/-	—
British Aluminium Ord.	1	5	5	32/-	—	3 2 6
British Insulated Ord.	1	15	15	72/6	—	4 2 8
Brush Ord....	Stock	Nil	Nil	40	—	—
Callender's	1	15	15	61/3	—⅛	4 18 6
Do. 6½% Pref.	1	6½	6½	30/9	—	4 4 6
Crompton Parkinson Ord. ...	5/-	22½	12½	25/-	—	—
Do. 8% Pref.	1	8	8	31/3	—	5 2 5
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	10/-	—	—
Enfield Cable Ord.	1	25	25	87/6	—	4 11 4
English Electric	1	Nil	Nil	6/3	—	—
Do. do. Pref.	1	Nil	Nil	8/9	—	—
Ever Ready	5/-	35	35	30/-	+1/-	5 16 8
Ferranti Pref.	1	7	7	26/-	—	5 7 9
G.E.C. Pref.	1	6½	6½	30/-	—	4 6 8
Do. Ord....	1	8	8	43/9	—	3 13 1
Henley's	1	30	30	6½	—¼	4 17 10
Do. 4½% Pref....	5	4½	4½	5½	—	4 5 9
India-Rubber Preferred	1	—	—	15/-	—	—
Johnson & Phillips	1	5	5	22/6	+9d.	4 9
Siemens Ord.	1	7½	6½	1	—	—
Telegraph Construction	£1	Nil	Nil	25/-	—	—

* Dividends paid free of Income Tax

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings taken.

1932

13469. "Automatic regulation of the exciting currents of dynamo-electric machines." Siemens-Schuckertwerke Akt.-Ges. August 8th, 1931. (405974.)

13731. "Spark-gap apparatus particularly adapted for the conversion of electric current." E. Marx. May 12th, 1931. (406003.)

16679. "Dynamo-electric machines." General Electric Co., Ltd., and R. Orsettich. June 13th, 1932. (406004.)

16898. "Cathode-ray tubes." M. Von Ardenne. June 19th, 1931. (405977.)

19856. "Braun tubes more particularly for television purposes." Fernseh Akt.-Ges. July 31st, 1931. (406009.)

20137. "Electric locomotives employing metallic-vapour rectifiers for supplying current to the driving motors thereof." Siemens-Schuckertwerke Akt.-Ges. July 20th, 1931. (406010.)

20727. "Systems for converting direct into alternating current." International General Electric Co., Inc. July 22nd, 1931. (406045.)

22227. "Processes for the manufacture of luminescent screens, suitable for use in Braun tubes and like apparatus." Telefunken Ges. für Drahtlose Telegraphie. August 6th, 1931. (405964.)

22504. "Electrolytic installations with variable internal characteristics." Compagnie de Produits Chimiques et Electrométallurgiques Alais, Froges et Camargue. August 12th, 1931. (405966.)

22657. "Arc rectifiers." Siemens-Schuckertwerke Akt.-Ges. September 19th, 1931. (406017.)

22767. "Electro-magnetic means for producing intermittent rotational motion." E. A. Watson. August 13th, 1932. (406020.)

23464. "Automatic reclosing mechanism for oil circuit-breakers." Johnson & Phillips, Ltd., and P. M. Wood. August 22nd, 1932. (406049.)

23465. "Transformer 'on-load' tap-changing mechanism." Johnson & Phillips, Ltd., and J. Bloome. August 22nd, 1932. (406050.)

24008. "Switch device for direction indicators for motor and other vehicles." A. J. Forsstrom and J. F. Thelander and C. G. T. Salenius. August 27th, 1932. (406057.)

24239. "Electrical voting apparatus." M. F. Thompson. August 30th, 1932. (406060.)

26719. "Mercury-vapour rectifiers." Akt.-Ges. Brown Boveri et Cie. September 26th, 1931. (406075.)

28018. "Circuit arrangement for electromotive driving devices for selecting switches of the kind used in automatic telephone and other remotely controlled selective systems." Siemens & Halske Akt.-Ges. October 7th, 1931. (Addition to 385412.) (406079.)

32474. "Hand or portable electric flashlamps." E. Wood. November 17th, 1932. (406097.)

32513. "Commutators for dynamos, electro-motors and the like." H. Allwood. November 17th, 1932. (406098.)

33519. "Hanger for the suspension of overhead electric current conductors." F. Morris. November 26th, 1932. (406105.)

34828. "Rotary switch mechanisms." Standard Telephones & Cables, Ltd., and G. Newton. December 8th, 1932. (406111.)

35546. "Construction and/or arrangement of single motion switches." Standard Telephones & Cables, Ltd., G. Newton. December 15th, 1932. (406113.)

35867. "Electric battery lamps." J. Lucas, Ltd., and F. Hanmer. December 17th, 1932. (406114.)

1933

83. "Electric motor control systems." British Thomson-Houston Co., Ltd. January 2nd, 1932. (406119.)

6418. "Control of electrically operated mechanism." International General Electric Co., Inc. March 2nd, 1932. (406133.)

11046. "Method and device for guiding aeroplanes by means of short waves, particularly ultra-short electromagnetic waves." C. Lorenz Akt.-Ges. September 22nd, 1932. (406144.)

14295. "Excess voltage discharge devices." British Thomson-Houston Co., Ltd. May 17th, 1932. (Addition to 344092.) (406166.)

17953. "Connection and supporting device for electric lamps provided with a screw cap." P. Esquirol. July 13th, 1932. (406182.)

17967. "Methods of electrically heating or drying materials." National Electric Heating Co., Inc. February 5th, 1932. (Divided application on 21975/32.) (405997.)

18619. "Process for sealing off gasfilled vessels such as electric incandescent lamp bulbs." Vereinigte Gluhlampen und Electricitäts Akt.-Ges. June 30th, 1932. (406185.)

18537. "High-power high-tension continuous-current machines." Akt. Ges. Brown Boveri et Cie. July 15th, 1932. (406190.)

20652. "Telephone mouthpiece attachment." M. M. E. Furey and S. F. Kaye. July 21st, 1933. (406198.)

20821. "Electric transformers, condensers, switches and the like." British Thomson-Houston Co., Ltd. July 23rd, 1932. (406201.)

22987. "Arrangements for sealing wires into electric discharge vessels." General Electric Co., Ltd. August 27th, 1932. (406214.)

23551. "Wave-change switching arrangements for wireless receivers." D. Rich and Sunbeam Electric, Ltd. August 24th, 1933. (406219.)

26370. "X-ray tubes." C. H. F. Muller Akt.-Ges. October 22nd, 1932. (406227.)

28974. "Methods of grid control in vapour- or gas-discharge valves." British Thomson-Houston Co., Ltd. October 19th, 1932. (406234.)

30143. "Cathodes for mercury-vapour rectifiers." English Electric Co., Ltd. October 29th, 1932. (406238.)

1934

1006 and 1426. "Light projector signals." British Power Railway Signal Co., Ltd., S. L. Glenn and E. E. Pierce. July 14th, 1932. (Divided application on 19981/32.) (406968 and 406042.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 7th.

Mavox. No. 546824. Class 8. Instruments and apparatus and parts thereof for use in radio-telephony and telegraphy.—Mavox Radio, Ltd., 21, Store Street, Tottenham Court Road, W.C.1.

Hydrolux. No. 543047. Class 8. Electric cells, accumulators and batteries (not for medical purposes).—F. Arnold Best & Co., 21, Old Queen Street, Westminster, S.W.1.

Electro-magnetic Separating Pulleys

THE use of d.c. magnetic separators is now general in many industries for the protection of machinery from damage due to "tramp" iron in the feed and for obtaining a more valuable final product because free from iron.

The magnetic pulley is commonly substituted for existing head pulleys in belt conveyors, thus avoiding sacrifice of space. The material is discharged downwards as it passes over the magnetic pulley, while any iron contained amongst the feed is attracted and held firmly against the belt surface until it is carried round far enough out of the magnetic field to be automatically discharged into a suitable container without the aid of scrapers or other mechanical means. A typical pulley has its width divided into separate units which consist of a core and two poles. The spool carrying the magnetising coil is fixed upon the core in such a manner that any movement is impossible. The poles are of circular section and are arranged to give an even flux distribution around the pulley. All parts of the magnetic circuit are built up from high-permeability steel forgings or castings to give the greatest possible value of B with H at a reasonable figure.

The number of cores and poles depends on the width of the pulley and also on the nature of the feed, *i.e.*, whether it is desired to obtain a deep penetration through the feed. A pair of slip rings is mounted at one end of the shaft and provided with brushgear by means of which the current is conveyed to the revolving coils. Each coil is protected by a circular cover which also provides a support for the belt. While it is usual to make these covers of non-magnetic material, steel covers can be used with apparently satisfactory results despite the general belief that steel at this point would short-circuit the magnetic flux.

General experience indicates that the greatest efficiency of extraction is obtained when the pulley makes 30 to 35 r.p.m. irrespective of its diameter. Due to the comparatively slow speed, it is essential that the pulley be crowned unless flanges are provided to keep the belt central. The magnetic field is not of constant strength across the width of the pulley. The greatest intensity is adjacent to the poles and reaches a point, known as the neutral point, where the pull from each pole is equal and opposite, giving a zero resultant pull.

The pull exerted by a magnet varies as B^2 in the poles, and consequently a pulley wound with insufficient ampere-turns for the cross-section will exert a pull far below that possible though the pulley will be cheap due to the small amount of copper used. In the same way a design using a very high value of B calls for an uneconomic value of H, so that to obtain sufficient ampere-turns the coil must be very highly rated, with consequent deterioration in service.

The coils are wound with insulated wire, the type of covering depending on the conditions under which the pulley will work and the working temperature of the coil. After winding the coils are dried out and either dipped and stoved or subjected to a vacuum impregnation treatment in which the coils are dried out under a vacuum, the varnish afterwards being forced in under pressure. The coils after this treatment are moisture resistant and have a high insulation value combined with improved heat-radiating qualities.

One of the largest magnetic pulleys yet made has a diameter of 48 in. and a length of 40 in. and weighs 5½ tons. This was manufactured by the Rapid Magnetting Machine Co., Birmingham, and was installed in a conveyor dealing with 200 tons of coal per hour. A development of the pulley is the combined type consisting of a magnetic pulley and a short conveyor belt running over an idler pulley. The feed is discharged upon the belt from a hopper or chute and is carried forward over the magnetic pulley.

Due to the highly inductive nature of these magnets a non-inductive resistance is connected across the magnet winding at the instant the supply circuit is broken to protect the insulation against induced high voltages. With the largest sizes of pulleys a controller with graded resistances is used.

H. E. HUTTER.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Airdrie.—Houses (1,375) and swimming baths (£12,000); J. K. Frazer, burgh surveyor, Royal Buildings.

Alloa.—Houses (38), Mold Street (£11,000); Robert Cairns, burgh surveyor, Municipal Buildings.

Barking.—Church, Barking side of Becontree Housing Estate (£10,000); Bishop of Chelmsford.

Barnsley.—Infants' school, Littleworth; H. Taylor, surveyor, Town Hall.

Barrow-in-Furness.—Bus depôt, Jute works site (£18,000); borough engineer.

Beckenham.—School, Hawes Lane, West Wickham, with electrical work, for E.C.; Mr. Burgoyne, architect.

Bedford.—Schools, London Road, for Borough E.C.; director of education.

Berwick.—Houses (100), North Road; burgh surveyor, Municipal Buildings.

Birmingham.—Factory and offices, Brearley Street, for Brightside Plating Co.; C. Twigg, builders, Theodore Street, Aston. Factory, Hospital Street and Henrietta Street, for Smith & Davies, Hampton Street (£7,000), with electrical work; Whittall & Sons, builders, Lancaster Street. Addition to premises, Well Street, for Lucas, Ltd., Gt. King Street (£40,000), with electrical work; Gateley & Parsons, architects, 105, Colmore Row. Baths, Northfield and Kingstanding and alterations St. George's Baths (£49,000), and enlargement, Little Bromwich Hospital (£30,000); city engineer.

Bolton.—Houses (54), Callis Road; J. R. Bushell. Houses (26), Hall Wood Estate; William Townson & Sons, Ltd.

Brighton.—Rebuilding Hove Hospital (£25,000); Field & Cox, Ltd., Brighton.

Bristol.—Houses (100), Knowle & Bedminster Estates (£29,367); John Knox (Bristol), Ltd. Hotel (£70,000) with electrical work; C. Green & Sons, builders, 132, Monument Road, Edgbaston, Birmingham.

Bromley.—Cinema (2,500 seats), for the Gaumont-British Corporation.

Cawsand (NEAR PLYMOUTH).—Hotel, installation of lighting and heating (£40,000); Barron & Rooke, architects, 1, Sussex Terrace, Plymouth.

Cheshire.—Schools, Gatley, and Pensby, Wirral, for County E.C.; F. A. Browne, county architect, Chester.

Chislehurst.—Houses, Petts Wood Estate; Morrell (Builders), Ltd.

Coatbridge.—Houses (118), Calder Street; J. Spence, burgh surveyor, Municipal Buildings.

Croydon.—Houses (90), the Glade, and 24 cottage flats (£11,525); borough surveyor.

Dewsbury.—Houses (88), Pilgrim Farm, &c.; borough engineer.

Dudley.—School, Wren's Nest; Mr. Buckland, architect.

Durham.—Intermediate school, Easington Colliery, for County E.C.; F. Willey, architect, 34, Old Elvet.

Edinburgh.—Houses, Pilton, Granton Grove, Restalric, and schools, Loganlea Drive, Restalric; Granton Mains, Craigentinny, and R.C. School, Craigmillar (£18,000); E. J. MacRae, city architect, City Chambers.

Fraserburgh.—Houses (38); W. F. Hamilton, burgh surveyor, 51, Mid Street.

Glasgow.—Nurses' Home, &c., Gartwood Mental Hospital (£32,000); T. Sowers, burgh surveyor, City Chambers.

Gloucester.—Additions to Shire Hall (£10,645) with electrical work; Spackman & Sons, builders, Swindon.

Godstone.—Extensions, Felbridge School (£4,146); Cropley Bros., Ltd.

Gomersal.—Houses (22), Elm Grove, for J. Chrystall.

Grays.—Houses (30), U.D.C. surveyor. Houses (48), Grange Road; E. Fincham, architect.

Halifax.—Extensions to machine tool works, Arundel Street; G. R. Oddy, architect, Ward's End Chambers.

Hampshire.—Secondary school, Farnborough, for County E.C. (£30,000); director of education, Winchester.

Henley-on-Thames.—Houses (67); Universal Housing Corporation, Rickmansworth.

Hetton-le-Hole (DURHAM).—Houses (61); U.D.C. surveyor.

Ilford.—Houses (180), Ashburton Avenue, &c.; J. T. Perrin. Houses (380), Lexden Drive, &c.; G. F. Seigerts. Houses (30), Longwood Gardens; A. Smith. Cinema, Eastern Avenue; G. Coles.

Irish Free State.—(DUBLIN).—Houses (282), Crumlin housing area; H. G. Simms, housing architect, 3, Parliament Street, Dublin. (LIMERICK).—Houses (380), King's Island; city surveyor, City Hall. (MALLOW, Co. CORK).—Houses (46); D. J. Buckley, architect, Elmvale.

Kelso.—Town Hall (£10,000); Wm. Barclay, 213, W. Campbell Street, Glasgow, C.2.

Leeds.—Cinema, Chapel Street, Halton; J. B. Jones. Cinema, Lower Wortley Road; A. Willinson. Police Court extensions, Town Hall (£5,200); city engineer. Shops, Burley Wood Estate; A. & E. Mosley, Ltd.

Leek.—Houses (156), Haregate Estate; Mr. Beacham, U.D.C. surveyor. Cottage hospital (£20,000), for the trustees of the Memorial Cottage Hospital; Longden & Venables, architects, 60, St. Edwards Street. R.C. schools, George Street and Cruso Street; priest-in-charge.

Lee-on-Solent.—Cinema, &c. (£30,000); European Commercial Corporation, Ltd.

Lincoln.—Senior schools, St. Giles (£15,263), for City E.C.; director of education.

Litherland (NEAR LIVERPOOL).—Church, School Lane (£10,000); L. Pritchard, Moorfields, Liverpool.

Liverpool.—Factory extensions, Aintree, for W. & R. Jacob, Ltd.

London.—(BATTERSEA).—Clearance of Didcot area (£51,000); L.C.C. architect. (BETHNAL GREEN).—Reconstruction of Poo Street (£87,000); L.C.C. architect. (CLAPHAM).—Tenements, Clapham Park Estate (£133,000); L.C.C. architect. (ISLINGTON).—Tenements, Hope Street (£15,000); L.C.C. architect. (POPLAR).—Tenements, Maltings Estate (£70,000); L.C.C. architect. (WEST HAM).—Extensions to Whipps Cross Hospital, and nurses' home (£140,000); borough engineer. (WOOLWICH).—Houses (1,100), Eltham; and dwellings, Shepherds Farm Estate (£43,760); borough engineer.

Maidstone.—School (£11,726) for Borough E.C.; R. Corben & Son, builders.

Manchester.—Senior school, Barlow Hall, and extensions, New Moston Junior School; city architect. Extensions, Queen's Road bus depôt; Alfred Hodkinson, Ltd.

Morden (SURREY).—Houses (1,357), St. Helier Estate; L.C.C. architect.

Motherwell and Wishaw.—Houses, Greenhead Road, Milton Street and Windmillhill Street; L. Costley, burgh surveyor, Town Hall, Motherwell.

Nelson (LANCS).—Houses (35); borough surveyor.

Newcastle-on-Tyne.—Houses (800), Buckingham Street, Wellington Street, Barrack Road and Oyster Shell Lane; F. H. Holford, city architect. Junior and infants' school (900 places), Cragside Estate, for E.C.; A. K. Tasker, architect, Trinity Buildings, New Bridge Street.

Port Glasgow.—Houses (48), Glasgow Road (£16,200); J. Murray, burgh surveyor, Anderson Street.

Portsmouth.—Development of Baffins Estate, for Morey & Flowers; C. W. Bevis & Sons. Extensions, Royal Naval Maternity Home; Governors.

Queensbury (YORKS).—Houses (232), Hunger Hill Estate, for R. J. Patchett.

Reading.—School extensions for the Governors; Charles Smith & Sons, architects, 164, Friar Street. Houses (288), Elms Estate, Caversham, for Industrial Builders, Ltd., 9, Tavistock Road, Croydon.

Ridgeway (SHEFFIELD).—Houses (1,500), Frecheville Estate; First National Housing Trust, Ltd.

Romford.—Bazaar stores, South Street, for Marks & Spencer, Ltd., London.

Rotherham.—Four schools (£74,650), for Borough E.C.; director of education. Alterations, Regent Picture House, Howard Street; Rotherham Cinema, Ltd.

Rothesay.—Bathing pool (£5,000); A. Stephen, burgh surveyor, 41, High Street.

Rugeley.—Cinema, Horsefair, for C. Deeming, Coalville; Hurley Robinson, architect, Cadogan Chambers, 6, Cherry Street, Birmingham.

St. Albans.—Houses (150), Watford Road; F. P. Scott & Co., Slough.

Saddleworth (YORKS).—Houses (32), St. Mary's Estate, Greenfield, for Buckley & Roseblade.

Sandbach.—Electric lighting installation, Technical Schools, for E.C.; H. Ferrand, clerk.

Scarborough.—Rebuilding premises, North Marine Road (£3,067); T. Wilcox.

Sheffield.—Houses (42), Cardoness Road; T. W. Knowles & Sons. Houses (84), Lees Hall Road; W. & J. Laver. Houses (86), Shiregreen Estate (£28,100); G. & C. Whittle, Ltd.

Smethwick.—Factory, Halberton Street, for Hudson & Wright, Grove Street (£6,000), with electrical work; Whittall & Son, builders, Lancaster Street, Birmingham.

South Shields.—Houses (70), Marsden Road, for Col. R. Chapman; F. W. Newby, architect, 37, King Street. Houses (49), Windsor Gardens, Chester Gardens and Sunderland Road; G. Thornton, builder, Morpeth Avenue.

Sowerby Bridge.—Houses (480), Beechwood Estate, and bungalows; borough surveyor.

Staffordshire.—School (600 places), Quarry Bank, for County E.C.; education architect.

Stockton-on-Tees.—Public hall and museum (£31,000); J. P. Wakeford, borough engineer.

Sunderland.—Houses (88), Leechmere Road; T. P. Collinge, borough engineer.

Surrey.—School, Valley Road, Kenley, for County E.C.

Sutton Coldfield.—Houses (250), Boldmere; Edge Hill Investment Property Co., Ltd. Houses (24), Chester Road; A. Francis. Houses (42), Kathleen Road; borough engineer. Houses (175), Wylde Green; A. T. Reynolds & Co. School, Cofield Road, for E.C.

Tunbridge Wells.—Assembly hall (£45,000); borough surveyor.

Upminster.—Houses (24), Little Gaynes Gardens, for A. J. Smith.

Wakefield.—Houses (140), various estates; city architect.

Wallasey.—Houses (20), Bridle Road, for H. Carlisle. Houses (26) and shops, Reeds Lane, for William Ellis.

Walsall.—Extensions, Nurses' home, Manor Hospital (£3,028); borough engineer.

West Riding.—Extensions to Council School, Upton; H. Wormald, architect, County Hall, Wakefield.

Watford.—Houses; Watford Garden Estate, Ltd.

Whitby.—Houses (100); U.D.C. surveyor.

Whyteleafe (SURREY).—Swimming bath, Godstone Road, for Plus Pools, Ltd.; Todd & Higgins, architects.

Wolverhampton.—Houses (147), Oxley Manor Estate; Pidgeon Bros.

Worcestershire.—Extensions, Brook Street School, Stourbridge, for County E.C.

Worsley.—Public baths; U.D.C. surveyor and superintendent, Manchester Corporation baths.

Worthing.—Houses (33), Broomfield Road; R. Hasler.